The Value of Growth: Changes in Profitability and Future Stock Returns*

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November 2016

Abstract: The change in a firm's profitability, or profitability growth, has incremental power to predict stock returns over current profitability and other well-known cross-sectional determinants. From 1975 to 2014, the Fama and French five-factor alpha on a long-short strategy based on profitability growth is 1.14% per month. This strategy remains highly profitable after controlling for size, book-to-market ratio, profitability, or momentum. The effect is stronger among firms experiencing steady, as opposed to dramatic, changes in profitability growth. An augmented Fama and French three-factor model that includes a profitability-growth factor captures the momentum anomaly at least as well as other prominent factor models.

JEL classification: G11; G12

Keywords: Profitability; Growth; Return Predictability; Stock Returns

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* For helpful comments and discussions, we thank Michael Brennan, Allaudeen Hameed, Kewei Hou, Igor Goncharov, Andrew Karolyi, Robert Korajczyk, Spencer Martin, Ron Masulis, Ingmar Nolte, Ken Peasnell, Jianfeng Shen, Josef Zechner, Qi Zeng and seminar participants at Lancaster University. We also appreciate the comments of participants at the 2016 FIRN Annual Conference.

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1. Introduction

The dividend discount model of firm valuation implies a positive relation between future profitability and expected stock returns. Fama and French (2006) characterize future profitability as a combination of current profitability level and future profitability growth. Recent literature has documented a strong predictive relation between the first component, the level of current profitability, and the cross section of stock returns (e.g., Novy-Marx 2013, Fama and French 2015, Hou, Xue and Zhang 2015, Ball et al., 2015). The second, a growth component of profitability and its implications, has been examined to a much lesser extent.

In this study, we introduce a new profitability-growth measure and present comprehensive evidence of its empirical relevance as a source of profitability effects. We define profitability growth as the most-recent, year–over–year change in a firm's quarterly profits, scaled by its quarterly book equity lagged four quarters.[1] To better proxy for true economic profitability, we follow the recent strand of the literature that focuses on "cleaner" earnings measures. Specifically, we examine a firm's changes in operating profits—revenue less cost of goods sold, selling, general, and administrative expenses, minus interest expenses—as defined by Fama and French (2015), gross profits—revenue minus costs of goods sold—as defined by Novy-Marx (2013), or operating profits—revenue minus cost of goods sold and selling, general, and administrative expenses, but not research and development expenditures—as defined by Ball et al. (2015). Each of these measures removes from accounting earnings items that the prior literature has found to predict stock returns (e.g., tax expense changes) but are harder to relate to a firm's future economic profitability.[2]

We start by reporting high persistence in our profitability-growth measure. In particular, current growth predicts future growth at least three quarters ahead. To the extent that persistent firm growth is a good proxy of future firm profitability, the valuation equation of the dividend discount model implies a positive relation between recent profitability growth and future returns. We find this theoretical relation to be borne out in the data. In cross-sectional regressions, growth has incremental power over, but does not subsume the role of, current profitability to explain expected returns regardless of the profitability measure used.

[1] Our emphasis on profitability growth is partly motivated by Novy-Marx's (2013, pp. 20) observation that quarterly monitoring of a firm's fundamental change better reflects the dynamic changes of the firm's competitive position.

[2] Several items lying between profitability and earnings are not related to profitability, yet they convey information about stock returns. Specifically, there are seven Compustat items from income before extraordinary item to gross profits (revenue minus cost of goods sold): Income before extraordinary item=Revenue-Cost of goods sold-Selling, general, and administrative expense-Interest-Depreciation and amortization-Taxes + Nonoperating income + Special items - Minority interest income. For example, Lev and Sougiannis (1996), and Chan, Lakonishok, and Sougiannis (2001) document a positive link between research and development expenditures and future stock returns, while Hanlon, Laplante, and Shevlin (2005) document a positive association between tax expense changes and future returns.

At an intuitive level, the importance of profitability growth for expected stock returns could be illustrated as follows. Consider two firms, A and B, showing equal profitability as of the last reporting date. Assume that firm A has shown a stable level of profits over time while firm B has reached its current profitability level by growing rapidly over a recent period. If future growth is correlated with current profitability but not with recent growth, the two firms should exhibit similar expected returns according to the dividend discount model. However, if profitability growth is persistent, firm B can be expected to continue growing in the future and its future profitability to exceed that of firm A. All else equal, the dividend-discount model implies that the expected returns to stock B should be higher than stock A.

We next show that using profitability growth as a proxy for future profitability strengthens the empirical validity of the valuation formula. In univariate portfolio tests, the average returns to profitability-growth-sorted portfolios for different horizons typically increase monotonically with profitability growth. The average spread in value-weighted returns between strong- and weak-profitability-growth firms is positive and large for at least up to twelve months after formation. The profitability-growth strategy of buying strong-growth firms and short selling weak-growth firms earns abnormal and positive returns after controlling for exposure to size, book-to-market, momentum, investment and, notably, the profitability factors of the Fama and French (1993), Carhart (1997), or Fama and French (2015) models. For instance, an equally weighted (EW) and value-weighted (VW) strong-weak growth strategy earns five-factor alphas—i.e., accounting for exposure to the profitability factor—of 1.14% and 0.68% (*t*-values of 8.55 and 3.89) per month over our sample period. Importantly, for the potential implementation of growth-based strategies, given that smaller stocks are costlier to short sell and trade, significant risk-adjusted returns can be attained as well with long-only positions.[3]

Using double-sort portfolio tests, we find that changing the focus from profitability levels to growth helps the valuation formula enhance the performance of size, book-to-market, momentum, and profitability strategies. The EW risk-adjusted returns to growth strategies fall with size but remain large and significant even for the top 20% largest firms in our sample, with a five-factor alpha of 0.54% (*t*-values of 3.68) per month. The enhancement in performance is particularly notable for book-to-market strategies. For EW portfolios, the growth strategy delivers risk-adjusted spreads exceeding 0.83% (*t*-values greater than 6) per month across all book-to-market bins and risk-adjustment models. Similarly, profitability-growth strategies can improve the performance of strategies that already control for momentum or for profitability in levels. The risk-adjusted returns to

[3] To limit the influence of nano-caps on our results we take two further steps: (i) we exclude all stocks with market capitalizations of less than $25 million; and (ii) we use NYSE breakpoints in all of our portfolio tests. As a result, the market capitalization of the typical strong- and weak-profitability-growth firms in our sample is above the 20th NYSE percentile below which a firm is commonly considered a microcap (e.g., Fama and French, 2008).

the profitability growth strategy exceed 0.73% and 0.52% (*t*-values greater than 5.2 and 3.8) per month across all momentum or profitability-level quintiles, respectively. The returns to these two-way sorted portfolios are typically smaller but remain economically and statistically significant in many relevant cases when we use VW portfolios instead.

Although our measure reflects profit innovations to some extent, we find evidence inconsistent with profitability growth reflecting purely the market underreaction to earnings surprises that is well documented in the post-earnings-announcement drift (PEAD) literature (Ball and Brown, 1968, Bernard and Thomas, 1989, 1990; Chan, Jegadeesh and Lakonishok, 1996; Novy-Marx, 2015a, b). First, profitability growth is positively correlated with the standardized unexpected earnings (SUE) measure used in the PEAD literature, but the correlation is relatively low (less than 0.31). Second, in Fama-MacBeth regressions, the SUE does not subsume the information content in profitability growth for predicting the cross section of expected returns. Third, we show that controlling for earnings surprises in double-sorted portfolio tests, the profitability-growth strategy delivers large and significant excess returns across SUE bins. Finally, the profitability-growth effect is driven by gradual and sustained—steady—changes in profitability. Because a positive (negative) change in profits after a sequence of similarly positive (negative) changes in the recent past is unlikely to come as a surprise to market participants, earnings surprises seem to be an unlikely driver of the profitability-growth effect we document.

We further test whether our focus on profitability growth sheds light on a recent debate about the relative explanatory power of alternative profitability-based factor models. More precisely, Fama and French (2016) point out that their five-factor model fails to account for the returns to the momentum strategy despite capturing many other pricing anomalies. By contrast, Hou, Xue, and Zhang (2016) show that their *q*-factor model, which also builds on profitability and investment factors, does a better job at explaining the momentum anomaly. We show that an augmented version of the Fama and French three-factor model that includes a profitability-growth factor fully accounts for the momentum effect. We further show that replacing the return on equity (ROE) factor in the *q*-model with the profitability-growth factor achieves similar or even better performance in capturing the average return to the momentum strategy. Finally, we assess the ability of the *q*-factor model to capture profitability-growth effects on stock returns. We find that, when we remove the earnings surprise component of the ROE factor, positively correlated to profitability growth by construction but arguably less clearly motivated from a *q*-theory of firm investment, the alpha of the profitability-growth strategy remains nearly as high and significant as in the Fama and French three-factor model.

For robustness, we repeat our analyses using alternative definitions of profits (gross profits as in Novy-Marx (2013) or operating profits as in Ball et al. (2015)), and a different deflator (book value of asset) for our profitability-growth measure, but find no significant difference with our baseline results. Since weak- and strong-profitability-growth firms tend to be relatively small, we also check that our results are not mechanically related to the January size effect (Rozeff and Kinney, 1976; Keim, 1986; Reinganum, 1983), according to which small firms largely outperform large firms in January. We find that this is not the case. Profitability-growth strategies neither outperform nor underperform in January and derive their abnormal returns from the remaining months of the year.

This study contributes to the literature on the cross-sectional determinants of stock returns. We follow closely the approach in Fama and French (2006), who adopt the valuation equation in the dividend-discount model to examine the impact of firm characteristics on stock returns in a unified framework. Following this model, Fama and French (2008) measure profitability as earnings scaled by the book value of equity but fail to find a significant relation between profitability and stock returns. Aharoni et al. (2013) provide supporting evidence for a positive relation between profits-to-equity and future returns. Recent studies (e.g., Novy-Marx, 2013; Ball et al., 2015) indicate that deflating profits by the book value of assets recovers the predictive power of profitability on stock returns. Similarly, Akbas et al. (2015) find that the deterministic trend in firms' gross profits scaled by the book value of assets is closely related to stock returns.[4] However, the weak empirical link between the more theory-driven measure of profitability, deflated by book equity and future returns, remains puzzling in light of the valuation formula of the dividend-discount model. Our analysis integrates fundamental and price momentum effects within the unifying perspective on average stock returns provided by the firm valuation equation (3) and advocated by Fama and French (2006). As with most studies in this literature, however, our analysis has no power to determine whether the observed relation between average returns and profitability growth is due to rational or irrational pricing. In particular, our results cannot distinguish whether (rationally) priced growth risk or limited investor attention, or a combination of the two, ultimately drives the profitability-growth effect.

This study also provides new empirical support for the use of profitability-related factors in linear-pricing models. Fama and French (2015) use the theoretically positive relation between firms' expected return and future profitability in the dividend discount model to introduce two new factors to the Fama and French (1992) three-factor model. The authors' five-factor model includes a profitability factor—i.e., robust minus weak (RMW). Similarly, Asness, Frazzini, and Pedersen (2014) construct a quality-minus-junk factor under the framework of the dividend-discount model by combining multiple signals that proxy for profitability, growth, safety, and payout. Hou, Xue, and Zhang (2015) propose a *q*–factor model in which an earnings-based factor (ROE) is the key in

[4] Our study is related to, but fundamentally different from Akbas et al. (2015). First, the relation between profitability growth and future returns follows directly from the valuation equation of the dividend-discount model. Second, our measure is economically different from a profitability trend and can be obtained directly from a firm's financial statements, without relying on statistical filters. Third, the equal- and value-weighted returns to the profitability-trend strategy in Akbas et al. (2015) are largely explained by the Fama and French five-factor model, while the same is not true for the returns to our profitability-growth strategies.

capturing the cross section of average stock returns. Given that their ROE factor combines past earnings and future growth (Novy-Marx, 2015a), our results facilitate an alternative interpretation, not necessarily based on the *q*-theory of firm investment, of their original findings.

The paper proceeds as follows. In Section 2, we describe our sample, variable construction, and examine the predictive power of profitability growth in regression analysis. In Section 3, we test for the economic significance of profitability growth using portfolio analyses. In Section 4, we examine the pricing power of profitability growth to capture the momentum anomaly and compare its performance to the *q*-factor model. In Section 5, we assess the robustness of strategies based on profitability growth in more detail and point out the limitations of our analysis. Section 6 concludes.

2. Profitability Growth and Returns

Fama and French (2006) use the dividend-discount model to relate firm profitability and investment, in addition to book-to-market and firm size, to average stock returns. According to this model, a firm's stock price is the present value of expected dividends. Clean-surplus accounting along with the dividend-discount model then imply:

$$M_t = \sum_{\tau=1}^{\infty} E(Y_{t+\tau} - dB_{t+\tau}) / (1+r)^{\tau}, \tag{1}$$

where M_t is the market value of the firm's equity, Y_t is the firm's profits, $dB_{t+1} \equiv B_{t+1} - B_t$ is the change in the book value of equity, and r is the discount rate of return on expected dividends. Dividing by time-*t* book equity gives the Miller and Modigliani (1961) valuation equation.:

$$M_t / B_t = (\sum_{\tau=1}^{\infty} E(Y_{t+\tau} - dB_{t+\tau}) / (1+r)^{\tau}) \Big/ B_t , \tag{2}$$

Holding all else equal, future stock returns should be positively related to future profits relative to book equity and to current book-to-market, and negatively related to growth in book equity due to reinvestments in profits (i.e., asset growth).

Following Fama and French's (2006, pp. 495) characterization of future profitability as a mix of the *current profitability level* and *future profitability growth*, we can rewrite Eq. (2) as follows:

$$\frac{M_t}{B_t} = \frac{\sum_{\tau=1}^{\infty} E(Y_{t+\tau} - Y_{t+\tau-1} + Y_{t+\tau-1} - dB_{t+\tau}) / (1+r)^{\tau}}{B_t}$$
$$= \frac{\sum_{\tau=1}^{\infty} E(dY_{t+\tau} + Y_{t+\tau-1} - dB_{t+\tau}) / (1+r)^{\tau}}{B_t}, \tag{3}$$

where $dY_{t+1} \equiv Y_{t+1} - Y_t$ is the one-period change in profits.

According to Eq. (3), holding all else equal, future stock returns should be positively related to the ratios of the *current profitability level* and *future profitability growth* to current book equity. Fama and French (2006) document a strong persistence in profits-to-equity. However, Fama and French (2008) and Aharoni et al. (2013) find that profits-to-equity do not significantly enhance the performance of a portfolio that controls for other well-known signals such as size or book-to-market. Subsequent literature has been more successful in using profits-related proxies for future profitability to predict future returns (Novy-Marx, 2013, Ball et al., 2015, Akbas et al., 2015). These findings led Fama and French (2015) to propose a five-factor model of the cross-section in stock returns. The two new factors—relative to their original three-factor model (Fama and French, 1993)—based on profits-to-equity and investment-to-assets, arise as natural choices given the valuation Eq. (2).

These more successful different proxies for expected profitability deflate profits by the book value of assets instead of by book equity. Ball et al. (2015) find that the predictive power of profits-to-assets comes from the multiplicative interaction of its two components, namely profit deflated by the market value of equity and the ratio of market value of equity to total assets. This finding obscures the argument for a profits-to-equity factor, based on the valuation equation, in a linear-pricing model. Even this profit-to-equity factor, when embedded in the Fama and French's (1993) three-factor model, fails to account for the price momentum anomaly (Fama and French, 2016). In what follows, we examine whether there is a role for the growth component of profitability in Eq. (3) in addressing these issues.

2.1. Data and profitability growth measure

Our sample includes all common stocks (share codes 10 or 11) traded on the New York Stock Exchange (NYSE), the American Stock Exchange (Amex) and Nasdaq comprised in the Center for Research in Security Prices (CRSP) monthly files. We obtain accounting data from COMPUSTAT. We exclude financial firms (i.e., firms with one-digit standard industrial classification codes of six), closed-end funds, real estate investment trusts, American depository receipts, and foreign stocks from our sample. We also exclude all stocks with market capitalizations of less than $25 million to eliminate nano-cap, illiquid stocks to which investors are unlikely to access.

Our main variable of concern, profitability growth, is measured as the change in profits over the book value of equity. Novy-Marx (2013) argues for gross profits (revenue minus costs of goods sold) as the cleanest profitability measurement. Fama and French (2015) use operating profits instead of gross profits to construct their five-factor model in which operating profits are defined as revenue less cost of goods sold and selling, general, and administrative expenses, minus interest expenses. Ball et al. (2015) argue that an alternative operating profit measure, defined as revenue minus cost of goods sold and selling, general, and administrative expenses, but not research and development expenditures, can better match current expenses with current revenues.

We use the operating profits definition of Fama and French (2015) to construct our baseline profitability-growth measure. Our choice is meant to facilitate a comparison with those of Fama and French (2006) and Aharoni et al. (2013) who, as we do, examine the explanatory power of profits deflated by book equity in the context of the Miller-Modigliani valuation equation. For robustness, we also employ Novy-Marx's (2013) gross profits and Ball et al.'s (2015) operating profits definitions to construct alternative profitability-growth measures. In all cases, we measure profitability growth using firm-level data.[5] Specifically, our baseline operating profitability growth (PG) measure at month *t* is defined as:

$$PG_{i,q} = (OP_{i,q} - OP_{i,q-4}) \big/ BE_{i,q-4}\,, \tag{4}$$

where $OP_{i,q}$ is the most recent quarter operating profits (REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items), $OP_{i,q-4}$ is the operating profits lagged four quarters, and $BE_{i,q-4}$ is the book equity lagged four quarters.[6] Our alternative PG measures follow the abovementioned profit measures of Novy-Marx (2013) and Ball et al. (2015).

2.2. Fama and MacBeth regressions

We first examine the explanatory power of profitability growth (PG) and current profitability (P/BE) in Table 1, which reports the average slopes and *t*-values from Fama and MacBeth (1973) cross-sectional regressions.[7] Our control variables include the log of book-to-market ratio, the log of size, asset growth, prior one-month returns and prior-year returns (Banz, 1981; Rosenberg, Reid, and Lanstein, 1985; Fama and French, 1992, 1993, 1996; Jegadeesh, 1990; Jegadeesh and Titman, 1993; Titman, Wei, and Xie, 2004; Cooper, Gulen, and Schill, 2008; Novy-Marx, 2013).[8] To reduce the

[5] Aharoni, Grundy, and Qi (2013) highlight the significant differences in accounting variables at the per- share level relative to at the firm level. For example, Fama and French (2006) fail to find empirical support for the negative relation at the per-share level between investment and average return in the dividend-discount model. Aharoni, Grundy, and Qi (2013) point out that changes in the number of shares due to new issues or repurchase mitigates the relation between the expected change in investment per share and expected return. They show that once the accounting variables are measured at the firm level, the Fama-French prediction is validated in the data. Following this observation, we construct all our accounting measures using firm-level data.

[6] Following Ball et al. (2015), we consider total assets as an alternative deflator in Section 4. Our qualitative results remain.

[7] We measure profitability growth as the months immediately after the most recent public quarterly earnings announcement dates (item RDQ), so as to ensure that the quarterly accounting variables are part of the public information set in each period. We require the fiscal quarter end that corresponds to the most recently announced quarterly earnings to take place within the three months leading to the portfolio formation date. We impose this restriction to exclude stale profits data.

[8] We follow the construction of book-to-market in Fama-French (1992), who measure book equity at the fiscal year end of the previous calendar year and define market equity as the market capitalization in December of the previous year. Market capitalization is the price times share outstanding from CRSP, in million dollars. Book equity is shareholder equity, plus deferred taxes, minus preferred stock where available. Stockholders' equity is as given in Compustat data item (SEQ) if available, or common/ordinary equity plus the carrying value of preferred stock

impact of extreme values, we trim the independent variables at the 0.5% and 99.5% levels.[9] We require a firm to satisfy the following criteria in order to be included for the cross-sectional regression analysis in a given month: (1) the firm must have return data in CRSP for the current month, *t*, the previous month, $t-1$, and the consecutive 11-month returns from month $t-12$ to $t-2$; (2) the firm must have sufficient data available on the Compustat annual (quarterly) file to calculate the book-to-mark market ratio and profitability growth; (3) the firm must have sufficient data available on the Compustat quarterly file to calculate the PG.

We construct the profitability-in-level measures by using both Compustat annual (i.e., P/BE(A)) and quarterly (i.e., P/BE(Q)) items. Panels A, B, and C of Table 1 define, respectively, profitability growth and levels following Fama and French's (2015), Ball et al.'s (2015) and Novy-Marx's (2013) definition of operating or gross profits, as previously detailed.

[Insert Table 1 here]

Model (1) indicates that profitability growth (PG) has incremental explanatory power over book-to-market, size, and past performance. The coefficient on PG is positive and significant (6.99 with a *t*–value of 10.62). Consistent with valuation Eq. (3), stronger profitability growth predicts higher future returns. In line with prior literature (Banz, 1981; Fama and French, 1992, 1996; Jegadeesh, 1990; Rosenberg, Reid, and Lanstein, 1985), the coefficient on book-to-market ratio is significantly positive, while the coefficients on market capitalization and prior one-month returns are significantly negative. Prior-year returns, which proxy for price momentum effects, turn insignificant once profitability growth is controlled for.[10] This suggests that profitability growth may absorb part of the momentum effect, consistent with recent studies pointing to earnings innovations as a driver of price momentum (Novy-Marx, 2015a, b).[11]

Profitability growth remains a significant determinant of returns after controlling for current profitability. From model (2), current profitability at quarterly frequency P/BE(Q) has incremental explanatory power in the cross-section over book-to-market, size, and past performance. Indeed, the

(CEQ+PSTX) if available, or total assets minus the sum of total liabilities and minority interest (AT–(LT+MIB)). Deferred taxes are deferred taxes and investment tax credits (TXDITC) if available. Preferred stock is redemption value (PSTKR) if available, or liquidating value (PSTKRL) if available, or carrying value (PSTK). The profitability in level for year *t* is measured as gross profits scaled by assets with fiscal year ending in (any month of) calendar year $t-1$. Gross profits are revenue minus cost of goods sold (REVT–COGS) and assets as given in Compustat data item (AT). Asset growth for year *t* is the percentage change in total assets (AT) from the fiscal year ending in calendar year $t-2$ to fiscal year ending in calendar year $t-1$. Market equity is lagged six months to avoid taking unintentional positions in momentum (Novy-Marx, 2013).

[9] Using 1% and 99% as the cut-offs produces similar results but significantly reduces the number of observations, especially for the regressions with many independent variables.

[10] In non-tabulated results, we find that the momentum effect is still present before the addition of profitability-growth variable.

[11] In the same vein, Hou, Xue, and Zhang (2015) suggest that shocks to profitability in levels are positively correlated to stock returns. In other words, firms with positive profitability growth tend to become momentum winners while firms with negative profitability growth tend to become momentum losers.

coefficient of operating profitability in levels is positive and significant (4.41, with a *t*–value of 7.67). However, the level of profitability does not subsume the information contained in growth. When both variables are included along with asset growth (I/A) in specification (3), the coefficient on PG falls from 6.99 on (1) to 5.78 while the coefficient on P/BE(Q) drops from 4.41 to 2.80, with *t*-values of 7.90 and 4.52, respectively.[12] The economic and statistical significance of PG does not drop when controlling for current profitability constructed by using Compustat *annual* items (P/BE(Y)) in model (4). Since the level of profitability remains significant in both models (3) and (4), we conclude that the level of—and the growth in—profitability have incremental power in predicting future returns.

The explanatory power of profitability growth does not depend on the particular definition of profitability. Using either Ball et al.'s (2015) measure of operating profits (models (5)–(8) in Panel B) or Novy-Marx's (2013) measure of gross profits (models (9)–(12) in Panel C), both the level and growth in profitability remain positively and significantly related to future returns, with PG further exhibiting similarly large *t*-values across the three measures.

Overall, profitability growth stands out as a powerful predictor of the cross-section of returns. These findings are consistent with the valuation equation (3) only to the extent that higher-profitability growth predicts higher future profitability. In the next subsection, we demonstrate that this is the case.

2.3. Profitability (growth) persistence

The valuation equation (3) implies a relation between expected returns and *future* values of profitability levels and growth. Therefore, the reported explanatory power of the *realized* values of profitability growth in Section 2.2 provide validation for the valuation equation only to the extent that past firm growth predicts future growth—i.e., growth is persistent—or profitability levels, or both.

Table 2 reports Fama-MacBeth regressions of profitability growth (PG, Panel A) and levels (OP, Panel B) on past values of profitability growth and levels using our baseline definition of operating profitability. Following Fama and French (2006), we include controls for past values of book-to-market (BM) and of asset growth (AG). To avoid overlap in the dependent and independent variables that can bias the average slopes due to autocorrelation, we consider up to three lags of each independent variable.

Profitability growth is strongly persistent across all specifications of Panel A. Although most of the predictability is concentrated in the most recent quarter, positive profitability growth leads to further growth up to three quarters ahead, with high *t*-values of the associated slopes. This persistence is robust to controlling for past profitability levels, book-to-market, and asset growth. Growth does

[12] We include assets growth in specification (3) to control for the investment component of the valuation Eq. (3). The significantly negative coefficient on I/A is consistent with the findings in Titman, Wei, and Xie (2004), Cooper et al. (2008), Aharoni et al. (2013) and Fama and French (2015).

not fully subsume the information content of past profitability levels to predict future growth or profitability levels, nor does it subsume the level of profitability. These results are consistent with the power of all four variables—profitability growth, current profitability, book-to-market and asset growth (i.e., investment)—to predict returns in Table 1.

Panel B of Table 2 suggests that growth is a noisier signal of future profitability levels. It is an economically and statistically significant predictor of future levels of profitability when used as the only predictor, but loses much of this significance when simultaneously controlling for past levels of profitability.

[Insert Table 2 here]

In non-tabulated exercises, we repeat our test using the definitions of profitability of Ball et al. (2015) and of Novy-Marx (2013) with very similar results. We also examine whether the persistence in growth is limited to particular size groups and find strong persistence in profitability growth across sizes.[13] Overall, the results in this section support the use of past profitability growth as a cross-sectional signal of future profitability growth. We next examine whether this signal can be reliably used for portfolio selection and, in particular, whether it enhances portfolio performance beyond other well-documented predictors.

3. Portfolios Tests

The Fama-MacBeth regression analysis of Section 2.2 suggests that a portfolio that overweights and underweights, respectively, stocks of strong- and weak-profitability- growth firms should earn positive returns. It further suggests that these returns should not be absorbed by variations in other, well-documented, cross-sectional determinants of returns such as book-market ratios. However, predictive regressions impose a potentially misspecified parametric relation between the variables. The portfolio tests in the next two subsections assess the economic significance of our results with independence of the parametric assumptions of predictive regressions.

3.1. Univariate sorts on profitability growth

Table 3 reports summary statistics for a univariate sort on profitability growth. At each month *t*, we sort stocks into deciles according to their operating profitability growth in the most recent quarter using NYSE breakpoints. The top decile consists of the stocks with the strongest operating profitability growth, whereas the bottom decile consists of the stocks with the weakest operating

[13] At each quarter, we assign each stock in the sample to one of two size groups, small and large, based on its market capitalization.

profitability growth. We report the characteristics and returns of both EW and VW portfolios of the stocks in each decile.

3.1.1. Summary characteristics

Panel A of Table 3 shows the time-series averages of cross-sectional operating profitability growth for ten decile portfolios. The top decile portfolio has an EW (VW) annual growth rate of 17.90% (11.5%) while the bottom decile portfolio has an EW (VW) annual growth rate of –12% (–9.91%). Consistent with our findings in Section 2.3, profitability growth is highly persistent. Strong- (weak-) profitability-growth firms tend to experience strong- (weak-) profitability growth in the quarters before and after the formation quarter. For example, over the quarter following the formation period, the strong-growth firms grow at an EW (VW) average annual rate of 10.47% (7.39%), while the weak-growth firms grow at an EW (VW) average annual rate of –5.84% (–5.79%). A similar pattern holds for the quarter preceding the formation period. With the exception of at most two deciles, the pattern is remarkably monotonic in both cases.

[Insert Table 3 here]

Panel B of Table 3 reports market capitalizations for each decile portfolio. In general, firms with both weak (decile 1) and strong (decile 10) PG are relatively small with weak PG firms showing the lowest market capitalization. Still, because our sample excludes tiny stocks the average and median firm in each group are larger than a typical microcap firm. Indeed, to compare the relative capitalizations of the profitability-growth deciles we compute the corresponding-period capitalization of size-sorted decile portfolios, from smallest (1) to largest (10), based on NYSE size breakpoints. The time-series average of the cross-sectional mean (median) capitalization of profitability-growth decile 1 is comparable to the mean (median) capitalization of size-sorted decile 6 (2), and that of profitability-growth decile 10 is comparable to the mean (median) capitalization of size-sorted decile 7 (3). Hence, the market capitalization of the typical strong- and weak-profitability-growth firms is above the 20th NYSE percentile below which a firm is commonly considered a microcap (e.g., Fama and French, 2008).

Panel C shows that, as is intuitive, strong-growth firms tend to be glamour stocks while weak-growth firms tend to be value stocks. Consistent with the predictability results in Section 2.3, Panels D and E report a strong positive association of profitability-growth firms with both operating profits-to-equity ratios and operating profits-to-asset ratios.[14] From a stock performance standpoint, Panels F and G show that profitability growth is also positively associated with price momentum. Since profitability growth captures innovations to profits, this result is unsurprising in light of Novy-Marx's (2015) evidence on the power of earnings momentum to predict stock return momentum. To

[14] This is consistent with the observation in Novy-Marx (2013) that profitable firms also tend to grow faster.

disentangle the effect of profitability growth from the effects of each of these correlated characteristics on portfolio returns, we apply two types of additional tests below. First, we adjust the return on PG-sorted portfolios for their exposure to the size, book-to-market, momentum, investment and profitability factors according to Fama and French's (1992) three-factor, Carhart's (1997) four-factor and Fama and French's (2015) five-factor models. Second, we control for these characteristics in our double-sort portfolio analysis of Section 3.2 below.

3.1.2. Raw returns

Table 4 reports returns to the ten PG-sorted portfolios, along with the return on the zero-cost investment portfolio that buys the strong-PG decile and shorts the weak-PG decile. Panels A and B present, respectively, EW and VW monthly returns over different holding periods. Specifically, after assigning firms to one of the 10 deciles based on profitability growth at month t, we calculate the EW and VW monthly returns for the following month $t + 1$ after portfolio formation (M1), from month $t + 1$ to $t + 3$ (M3), from month $t + 1$ to $t + 6$ (M6), from month $t + 1$ to $t + 9$ (M9), from month $t + 1$ to $t + 12$ (M12), and from month $t + 1$ to $t + 24$ (M24), respectively. The sample period is from 1975 to 2014.

Consistent with profitability growth as a strong predictor of returns, the returns to the profitability-growth portfolios typically increase with profitability growth across all holding periods. In the first month after portfolio formation, the difference in returns between strong- and weak-growth firms for the EW and VW portfolios are, respectively, 1.31% and 0.75% per month with associated *t*-statistics of 10.27 and 4.5. These returns amount to remarkable 15.7% and 9% annual EW and VW spreads between strong- and weak-growth stocks.

[Insert Table 4 here]

The spread in returns between strong- and weak-growth EW and VW portfolios remains large and significant for all holding periods up to 9 and 12 months, respectively, after portfolio formation. For example, strong-weak, profitability-growth VW portfolio returned an average 0.37% per month over a 12-month period, with an associated *t*-value of 2.74.

3.1.3. Factor-adjusted returns

Our previous analysis suggests that the profitability-growth strategy produces considerable returns. We show below that these returns remain significant and of similar magnitude after adjusting for their exposure to the three factors of Fama and French (1993), the four factors of Carhart (1997), or the five factors of Fama and French (2015). [15]

[15] The three factor of Fama and French (1993), the four factors of Carhart (1997), the five factors of Fama and French (2015) are obtained from Kenneth French's webpage.

[Insert Table 5 here]

Table 5 reports the abnormal returns (alphas) of the PG-sorted decile portfolios relative to each of these models. Panels A and B present, respectively, the risk-adjusted returns and factor loadings for EW and VW portfolios. In both panels, the strong-PG portfolios earn the highest alphas whereas the weak-PG portfolios earn the lowest alpha across all factor models. As a result, the strong-weak PG portfolio earns large and statistically significant three-, four- and five-factor alphas, both on EW and VW bases.

In particular, these alphas imply that the high returns on PG strategies cannot be fully explained by their exposure to momentum and current profitability. This is in spite of high-PG stocks capturing earnings-momentum effects and being selected based on profitability (growth) measures. The strong-weak PG portfolios load positively on the momentum and profitability factors. Notwithstanding, the EW and VW risk-adjusted monthly spreads are 1.06% and 0.56% (*t*-values of 8.96 and 3.60) after controlling for exposure to market, size, book-to-market, and momentum effects, and 1.14 and 0.68% (8.55 and 3.89) after controlling for exposure to market, size, book-to-market, investments, and profitability effects. Thus, the abnormal returns to the PG strategy are not only economically large but their associated *t*-values well exceed the cut-off *t*-statistic of 3 in Harvey, Liu, and Zhu (2016). Similarly to Novy-Marx (2013), we note that the strong-weak PG strategy is a growth strategy (it loads negatively on the value (HML) factor) and thus additionally provides a good hedge for value strategies.

Table 5 also shows that significant risk-adjusted returns can be attained with long-only positions based on profitability growth. The higher-PG EW portfolios (deciles 5 to 10) consistently earn large and significant alphas with respect to the three models. For example, a long position in the strong-PG EW portfolio earns monthly alphas of 0.84% (*t*-value of 8.39), 0.86% (*t*-value of 7.74), and 0.95% (*t*-value of 9.41) relative to the three-, four- and five-factor models. Since strong-PG firms are small to medium-sized, the alphas for the strong-PG VW portfolio are smaller but still highly statistically significant: 0.36% (*t*-value of 3.26), 0.25% (*t*-value of 2.22) and 0.45% (*t*-value of 3.82) relative to the three-, four- and five-factor models. The strong performance of long-only and VW positions is particularly important for the potential implementation of PG-based strategies, given that smaller stocks are more costly to short sell and trade.

3.2. Double-sorted portfolio tests

In the next subsections, we assess the economic significance of profitability growth to improve the performance of size, book-to-market, momentum and current profitability strategies. In each case, we apply dependent double sorts by sorting first on the control variable (e.g., size) and then on profitability growth, using NYSE breakpoints in both cases.[16] For each of the tables 6 to 9 below Panel A shows raw returns, whereas Panel B reports the risk-adjusted return spreads between strong- and weak-growth stocks after controlling for their exposure to the Fama and French's (1993, 2015) three and five factors, and by Carhart's (1997) four factors. The tables also report in Panels C and D the average book-to-market ratio and market capitalization, depending on the case of interest, of the 25 double-sorted portfolios.

3.2.1. Profitability growth and size

Table 6 indicates that firms with strong profitability growth outperform firms with weak profitability growth across size quintiles. This is true for both EW and VW portfolios strategies, suggesting that the profitability-growth effect is not limited to small firms but applies also to the most liquid stocks. Consistent with both strong- and weak-PG stocks being small to mid-sized, the quantitative impact on average spreads (before or after risk-adjustment) is larger on the smaller size quintiles, and falls with size up to the fourth size quintile, only to turn large and statistically significant again in the largest stock bin. For instance, the raw spreads on the weak-strong PG portfolio for the small, middle-sized (quintile 3), and big stocks are 1.66% (*t*-value of 13.17), 0.63% (*t*-value of 4.12), 0.44% (*t*-value of 2.89) per month for the EW strategies, 1.58% (*t*-value of 11.43), 0.61% (*t*-value of 4.01), and 0.38% (*t*-value of 2.23) per month for the VW strategies.

[Insert Table 6 here]

Panel B shows that excess returns to the strong-weak PG portfolios also represent an anomaly with respect to the three-, four-, and five-factor models across size quintiles.[17] The alphas with respect to these models are comparable in magnitude to the raw returns in Panel A. For instance, the five-factor alpha on the weak-strong PG VW portfolio for the small, middle-sized (quintile 3) and big stocks are 1.32% (*t*-value of 8.78), 0.54% (*t*-value of 3.51) and 0.43% (*t*-value of 2.32) per month.

Panel C shows the average book-to-market ratios of the 25 portfolios double sorted by size and profitability growth. Although strong-growth large firms tend to have smaller book-to-market ratios than weak-growth large firms, we note that strong-growth small firms tend to have smaller book-to-market than weak-growth small firms.

3.2.2. Profitability growth and value

Table 7 shows that the EW and VW average excess returns to the strong-weak PG portfolios are large and significant—with the exception of the middle VW bin—across all book-to-market quintiles.

[16] We use dependent instead of independent sorts to examine whether the profitability-growth effect remains robust after controlling for other effects. Regardless, we repeat our analysis using independent sorts with qualitative similar results.

[17] Novy-Marx (2015) also finds that a strategy based on year–over–year change in earning per share earns significant three- and four-factor VW alphas consistently across size quintiles.

Given the small-to-medium size of strong- and weak-PG stocks, the enhancement in average spreads is particularly high for EW portfolios. For instance, the average spread of the long-short PG strategy is, respectively, 1.23% (*t*-value of 9.89) and 1.32% (*t*-value of 8.09) per month for the glamour and value EW groups. Moreover, higher PG results in monotonically higher average raw returns across all EW book-to-market quintiles.

For VW portfolios, the PG strategy yields the highest VW average spreads for the extreme glamour and value groups. Since strong- (weak-) PG stocks are glamour (value) stocks, selecting stocks within book-to-market-sorted portfolios based on PG can be seen as aiding to sell (buy) high- (low-) expected return stocks among glamour (value) stocks. For example, firms with strong profitability growth outperform firms with low profitability growth by 0.83% (*t*-statistic of 4.34) and 0.65% (*t*-statistic of 2.75) within the glamour and value quintiles.

[Insert Table 7 here]

Panel B shows that profitability-growth strategies that control for book-to-market effects still earn abnormally high returns relative to all factor models. As in the abovementioned case of size-sorted portfolios of Subsection 3.2.1, adjusting for the exposure of these strategies to factor risks does not change (and even enhances in many cases) the magnitude of the excess returns. This is particularly evident in, but not limited to, the case of EW portfolios, in which the PG strategy earns more than 0.83% per month (*t*-value higher than 6) on a risk-adjusted basis across all book-to-market quintiles.

For VW portfolios, the profitability-growth strategy represents an anomaly relative to the Fama and French (1993) and Fama and French (2015) factor models within the extreme growth and value groups, for which raw returns increase monotonically with profitability growth. For instance, the five-factor alphas (*t*-value) for the growth and value quintiles are 0.79% (*t*-value of 3.91) and 0.54% (*t*-value of 2.15) per month despite already controlling for profitability effects. Even after controlling for exposure to the momentum factor, the performance of the glamour profitability growth remains large and significant. Strong- and weak-PG glamour firms are of middle size according to Panel C, so the profitability-growth strategy need not trade in small, illiquid stocks to attain these high risk-adjusted returns.

3.2.3. Profitability growth and price momentum

Panel F of Table 3 shows that prior six-month returns increase almost monotonically from the weak-PG decile P1 to the strong-PG decile P10. Equivalently, the stocks of higher-PG firms exhibit higher momentum, which could explain the average excess return to the PG strategy stocks. However, the high and significant 1-month Carhart alphas that this strategy produces (Table 5) suggests otherwise. Our analysis next provides further evidence against momentum as a likely driver of the profitability growth effect. Moreover, it indicates that the performance of the momentum strategy can be further enhanced by sorting momentum stocks by profitability growth.

[Insert Table 8 here]

Indeed, Table 8 shows a pattern of positive excess returns to the PG strategy across all momentum quintiles. Notably, these returns remain positive and statistically significant in most cases after adjusting for exposure to the momentum factor using the Carhart four-factor model. In fact, adjusting returns for momentum risk raises, rather than reducing, the magnitude of the PG effects across momentum bins.

The EW returns increase monotonically with PG in each momentum quintile, leading to average spreads in excess of 0.75% per month. Adjusting for the Fama-French three- and five-factor model does not reduce the statistical or economic significance of these spreads as all momentum quintiles earn alphas higher than 0.73% per month. Among VW portfolios, the PG effect is stronger in the extreme loser and winner bins, with raw spreads of 0.75% and 0.54% (*t*-values of 3.74 and 2.83) per month, and alphas with respect to the three-, four- and five-factor models of more than 0.60% (*t*-values higher than 3.24) per month.

3.2.4. Profitability growth and profitability in levels

We observed in Table 3 that strong-profitability growth firms typically exhibit high profitability levels. Several authors show that profitability is positively related to cross-sectional returns even after controlling for size and book-to-market ratios (Novy-Marx, 2013; Ball et al., 2015; Fama and French, 2015, Akbas et al., 2015). To ensure that our profitability-growth strategy does not simply mirror profitability-level strategies, we present its EW and VW performance across different profitability quintiles in Table 9.

[Insert Table 9 here]

In line with the results from our regression analysis of Section 2.2, Table 9 shows that profitability-growth strategies can improve the performance of strategies that control for profitability in levels. For EW portfolios (Panel A), the improvement is significant across all profitability quintiles, with raw and risk-adjusted spreads for the strong-weak PG portfolios, respectively, in excess of 0.60% (*t*-value of 4.19) and 0.52% (*t*-value of 4.28) per month. Within the group of profitable firms (quintile 5), the EW PG-strategy earns four-factor and five-factor alphas of almost 1% (*t*-values of 5.53 and 6.81) per month.

The profitability-growth strategy also earns significant VW average excess and risk-adjusted returns within the two extreme (unprofitable and profitable) profitability strategies. A long-short PG portfolio of unprofitable firms earns three-, four-, and five-factor alphas of 0.58% (*t*-value of 3.39), 0.46% (*t*-value of 2.64) and 0.50% (*t*-value of 2.86) per month, respectively. A similar strategy for the group of profitable firms earns three- and five-factor alphas of 0.45% (*t*-value of 2.08) and 0.71% (*t*-value of 3.13). Within the group of unprofitable firms, the profitability-growth strategy seems to load heavily on momentum, since the alpha becomes insignificant in controlling for this effect.

Tables A1 and A2 in the Appendix repeat the double-sort analysis of Table 9 using instead the alternative definitions of profitability detailed in Section 2.1. The results largely support the conclusions in this subsection. The magnitude and significance of the spreads on the profitability-sorted PG strategies remain practically unchanged using the operating profitability measure of Ball et al. (2015) both on EW and VW bases, except that the four-factor alpha of the PG-unprofitable VW strategy becomes (relative to Table 9) insignificant. Using the gross profitability measure of Novy-Marx (2013) results in significant alphas for the PG strategy within the group of profitable firms across all factor models (i.e., even after controlling for momentum effects), although for VW portfolios it drops the statistical significance of the four-factor alpha within the group of unprofitable firms.

Overall, the results in this subsection confirm that the growth dimension of profitability contains incremental value as a cross-sectional signal for stock selection over firms' current profitability levels.

3.3. Profitability growth and earnings momentum

Our profitability-growth measure reflects the most recent changes in firm profitability. Under a seasonal random-walk model for firm profits, these changes proxy for the surprise component of the firm's most recent profits or profit innovations. A large literature documents that earnings innovations (e.g., Ball and Brown, 1968; Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989; Chan, Jegadeesh, and Lakonishok, 1996; Novy-Marx, 2015a, b) are positively related to future risk-adjusted returns, an anomaly known as the "fundamental momentum," or post-earnings-announcement drift (PEAD), effect. In particular, Novy-Marx (2015a) shows that the year–over–year change in earnings per share, scaled by lagged book equity, price the ROE factor in Hou, Xue, and Zhang (2015). In this subsection, we show that our profitability-growth measure does not purely mirror the PEAD effect, as profitability growth remains positively related to cross-sectional stock returns even after controlling for earnings surprises.

Following the literature (e.g., Bernard and Thomas, 1989), we calculate standardized earnings surprises by assuming a seasonal random-walk model. Under this model, the standardized unexpected earnings (SUE) for month *t* are:

$$(EPS_{i,q} - EPS_{i,q-4}) / \sigma_{i,q} , \quad (5)$$

where $EPS_{i,q}$ is the most recently announced earnings per share, $EPS_{i,q-4}$ is the matching earning per share lagged four quarters, and $\sigma_{i,q}$ is the standard deviation of ($EPS_{i,q} - EPS_{i,q-4}$) over the prior eight quarters.[18] The fundamental momentum literature finds a strong positive relation between SUE and future returns.

In the next two subsections we argue that the PEAD effect is unlikely to be the sole driver of the profitability-growth effect. First, we present evidence of a limited relation between profitability growth and the SUE measure of earnings surprises. Second, we show that the profitability-growth effect is driven by gradual and sustained—steady—changes in profitability. Because a positive (negative) change in profits after a sequence of similarly positive (negative) changes in the recent past is unlikely to come as a surprise to market participants, earnings surprises seem an unlikely driver of the profitability-growth effect.

3.3.1. Relation between profitability growth and SUE

At an elemental level, we first note that profitability growth is positively correlated with earnings innovations, but the correlation is low. Table 10 reports Pearson and Spearman pairwise correlations between our profitability-growth measure, based on the baseline and alternative definitions of profitability of Section 2.1, and SUE over the 1975–2014 sample period. The correlation coefficient is positive and significant, but less than 0.31 in all cases.

[Insert Table 10 here]

We next show that SUE does not fully incorporate the information content in profitability growth for predicting the cross section of expected returns. Table 11 reports Fama-MacBeth regressions similar to the regressions in Section 2.2, by including the SUE. While SUE is highly significant across the three profitability-growth measures, it does not subsume the role of PG in explaining future returns, which remains significant (*t*-value higher than 2.12) and with the right sign across profitability measures (Panels A-C). Including SUE in our cross-sectional regressions does not drive out the effect of book-to-market (log(B/M)) or firm size (log(ME)) on future average returns, although it does absorb the role of investment (I/A) in predicting future returns.

[Insert Table 11 here]

More importantly, profitability-growth strategies can improve the performance of portfolios that control for earnings surprises. Panels A and B of Table 12 report monthly raw returns and the alphas estimated from time-series regressions of the monthly strong-weak PG portfolios' excess returns on the three-, four- and five-factor models, respectively. Panel C reports the market capitalization and book-to-market ratio of the 25 portfolios double sorted by profitability level and the SUE. At each

[18] We use earnings announcements made in the prior three months (month *t* - 2 to *t*) to avoid using stale earnings.

month *t*, we rank stocks based on their standardised change in earnings from the most recent earnings announcement (SUE) and assign them to five bins from the lowest SUE (1) to the highest (5). A PEAD strategy takes long positions on the highest-SUE stocks and short positions on the lowest-SUE stocks. Within each SUE group, we subdivide stocks by profitability growth into five quintile portfolios using NYSE breakpoints, and hold the portfolios for one month.

[Insert Table 12 here]

When applying equal weighting, strong-PG portfolios outperform weak-PG portfolios across SUE quintiles. This is more pronounced for the top three SUE quintiles in which average raw returns increase almost monotonically with profitability growth within each SUE group. This results in sizable average spreads in returns between strong and weak profitability-growth firms for all but the second quintile. For instance, among high-SUE stocks, the PG strategy produces monthly alphas of 0.67% (*t*-value of 4.56), 0.56% (*t*-value of 3.74), and 0.83% (*t*-value of 5.56) with respect to the three-, four- and five-factor models.

VW average spreads between strong- and weak-PG portfolios are also generally positive, although less statistically significant. However, among low-SUE stocks firms with strong-profitability growth significantly outperform firms with low-profitability growth by 0.45% (*t*-value of 2.12) per month. A strategy that takes a long (short) position on firms with strong- (weak-) profitability growth remains highly profitable after adjusting for its exposure to factor risk. The strategy's alphas relative to the three-, four- and five-factor models are 0.75% (*t*-value of 3.62), 0.51% (*t*-value of 2.49), and 0.51% (*t*-value of 2.23) per month.

We conclude that profitability growth can be used as a reliable proxy for future profitability and thus future returns according to the dividend-discount model even after controlling for the PEAD effect.

3.3.2. 'Steady' vs. 'dramatic' changes to profitability

According to the PEAD literature, changes in earnings—the numerator of SUE—catch at least some market participants by surprise, who in turn fail to fully recognize the implications for future earnings. These investors' delayed response to the new information make prices change only gradually over time, creating a positive relation between past earnings surprises and future stock returns.

Thus, the possibility that the PEAD effect drives the PG effect we document relies crucially on the assumption that changes in profitability are largely unanticipated by—i.e., surprise—market participants. We explore the possibility of this hypothesis in Table 13, which contrasts the effect of 'steady' vs. 'dramatic' changes in profitability on future stock returns.

[Insert Table 13 here]

More precisely, we attempt to capture steadiness in the profitability growth of each individual firm by using the following non-parametric methodology. At each firm-quarter, we compute five corresponding profitability growth measures, i.e., PG_{q-1}, PG_{q-2}, PG_{q-3}, PG_{q-4} and PG_{q-5} reflecting the year–over–year change in profitability in the most recent five quarters. We define sequence of dummy variables $Dummy_1$,…, $Dummy_4$, by the condition that $Dummy_i$ equals 1 (respectively, -1) when profitability growth increases from quarter -(i+1) to quarter –i. We define the sum of all the dummies within a year, which ranges from -4 to 4, as Dummy. We split strong- and weak-PG firms into two groups. Among strong-PG (respectively, weak-PG) firms, the 'steady' group is made up of all firms Dummy>=0 (Dummy<=0) whereas the 'dramatic' group is made up of all firms with Dummy<0 (Dummy>0). The table reports the monthly returns to the long-short steady growth portfolio ($P5_S$-$P1_S$) and the long-short dramatic growth portfolio ($P5_D$-$P1_D$).

Table 13 indicates that the PG effects on stock returns is mostly driven by steady changes in profitability over the recent past. For instance, using Fama and French's (2015) operating profitability measure to compute PG the EW PG spread following a steady growth path is almost twice as large as the EW PG spread after a dramatic growth path. Moreover, the statistical significance of the effect of dramatic growth on future returns is typically weaker, and even insignificant in the case of VW portfolios, while the significance of steady changes improves across all measures.

Arguably, steady changes are less likely to lead to large revisions in investors' expectations, reducing the chances of occurrence of the delayed investor reaction to new information the drives the PEAD effect. This provides further evidence against the PEAD anomaly as a main driver of the profitability growth effect.

4. Momentum Returns, Profitability Growth and the *q*-Factor Model

The dividend-discount model, particularly in its version of Eq. (3), predicts a relation between profitability growth and stock returns. This prediction finds strong empirical support in our tests of Sections 2 and 3. Following Fama and French (2015), it seems natural to examine the pricing performance of models that includes a profitability-growth factor, strong-minus-weak (SMW), either as the single factor or as one of the multiple factors in Fama and French three- and five-factor models:[19]

[19] We follow Fama and French (2015), and Hou, Xue, and Zhang (2015) to construct the strong-minus-weak (SMW) factor. Specifically, at each month we use the median NYSE size breakpoints to split NYSE, Amex, and Nasdaq stocks into two groups, small and big. Independently, at each month, we assign all stocks into three profitability-growth groups, using the NYSE breakpoints for the weak 30%, middle 40%, and strong 30% of the ranked values of most-recent-quarter PG. We require most-recent-quarter PG to be within three months prior to the portfolio formation date. We then take the intersections of the two size and three PG groups to form the value-weighted SMW portfolio (i.e., ½(big/strong+small/strong)-½ (big/weak+small/weak)).

$$R_{i,t} - R_{f,t} = \alpha_{i,t} + p_i SMW_t + \varepsilon_{i,t}, \quad (6)$$
$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_i (R_{MK,t} - R_{f,t}) + s_i SMB_t + h_i HML_t + p_i SMW_t + \varepsilon_{i,t}, \quad (7)$$
$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_i (R_{MK,t} - R_{f,t}) + s_i SMB_t + h_i HML_t + c_i CMA_t + p_i SMW_t + \varepsilon_{i,t}, \quad (8)$$
$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_i (R_{MK,t} - R_{f,t}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + p_i SMW_t + \varepsilon_{i,t}, \quad (9)$$

where R_{it} is the returns of the stock *i* in month *t*, MKT is the returns of the market portfolio, R_{ft} is the risk-free returns, and SMB is the difference between the returns on a diversified portfolio of small and large stocks, HML is the difference between the returns on a diversified portfolio of high and low B/M stocks, RMW is the difference between the returns of diversified stock portfolios with robust and weak profitability, and CMA is the difference between the returns of diversified stock portfolios of low- and high-investment firms. The profitability growth-based factor we introduce, SMW, is the difference between the returns of diversified stock portfolios of strong and weak profitability-growth firms.

[Insert Table 14 here]

Fama and French (2016) argue that their five-factor model can explain many anomalies but not the momentum effect according to which recent winners continue to outperform recent losers. Hou, Xue, and Zhang (2016) show that their *q*-factor model, based on similar profitability and investment measures, outperforms the five-factor model in explaining momentum profits. Thus, we are particularly interested in examining to what extent the growth component of profitability reconciles the valuation theory behind the five-factor model with the momentum anomaly, such as the *q*-factor model does with the *q*-theory of investment. By doing so, we hope to shed light on the conflicting performance of otherwise largely similar models.

We present the results of regressing the VW returns to the momentum (winner-minus-loser) portfolio on the Fama and French's (2015) five factors and the SMW factor in Panel A of Table 14.[20] The first, second, and third specification of Panel A confirms that the capital asset pricing model, the Fama and French (1993) three-factor model, and the Fama and French (2015) five-factor model cannot account for the momentum effects. The momentum monthly alphas relative to each of these models are all economically and statistically significant, and equal to 1.31% (*t*-value=4.15), 1.53% (*t*-value=4.73), and 0.99% (*t*-value=2.62), respectively.

By contrast, column (4) shows how the SMW factor alone can account for the average returns to the momentum strategy. The single-factor SMW model captures 32.9% of the momentum return

[20] All NYSE, Amex and Nasdaq stocks on the CRSP monthly file are ranked on the basis of cumulative prior-year returns (skip one month), and assigned accordingly to ten deciles. Stocks with the highest returns in the prior year are defined as winners while stocks with the lowest returns during the same period are defined as losers. The momentum strategy buys prior winners and sells prior losers. Zero-investment winner-minus-loser portfolios are reconstructed at the start of each month, and held for one month. A one-month gap exists between portfolio formation and portfolio investing in order to avoid the mechanical bid-ask bias.

variation, as momentum stocks load highly on profitability growth—the strategy's loading on the SMW factor is 1.81 and highly significant. More importantly, the one-month risk-adjusted return to the momentum strategy turns negative and insignificant (-0.05, with a *t*-value of -0.15) after controlling for exposure to the SMW factor only.

Specifications (5) and (6) show that augmenting the Fama and French three-or five-factor models with a profitability-growth factor also turns the momentum anomaly economically and statistically insignificant. The augmented model alphas are 0.14% (*t*-value=0.44) and -0.03 (*t*-value=-0.08), respectively. The coefficient on SMW is large and highly significant in both cases, equal to 1.90 (*t*-value of 9.07) and 1.83 (*t*-value of 9.15). The growth-based factor substantially increases the power of both models to explain momentum, as reflected by the increase in adjusted R-square from 6% and 12% in models (2) and (3) to 38% and 39% in models (5) and (6).

To further understand the relation between our SMW factor and the Hou, Xue, and Zhang's (2015) ROE factor, we add the SMW factor into the *q*-factor model and test its relative explanatory power in models (7)-(9). Our goal is to determine whether our growth-based factor just mirrors the ROE factor or, on the contrary, contains incremental information over the ROE. We summarize the results of regressing the returns to the momentum strategy on the Hou, Xue, and Zhang (2015) *q* factors and the SMW factor in Panel B of Table 14.[21] Specification (7) replicates Hou, Xue, and Zhang's (2015, 2016) findings that the *q*-factor model accounts for momentum profits, as momentum *q*-factor alpha turns economically and statistically insignificant (equal to 0.20%, with an associated *t*-value of 0.52).

Notably, adding the profitability-growth factor into the *q*-factor model results in the coefficient on ROE dropping by more than half of its value, from 1.56 (*t*-value of 7.59) in the specification (6) to 0.68 (*t*-value of 3.08) in specification (8). The explanatory power of the ROE factor seems largely absorbed by the growth factor, as the coefficients on the SMW factor are large and significant in both specification (8) and (9). The adjusted R-square increases from 30.39% to 38.19% when the ROE factor is replaced by the growth factor in model (8). This suggests that a revised version of the Fama and French (1993) model that includes a profitability-growth factor performs at least as well as the *q*-factor in explaining the variation in momentum returns over time.

Our results are consistent with Novy-Marx (2015a,b) who argues that price momentum is driven by momentum in fundamentals as reflected by, for example, the change-in-ROE component of Hou, Xue, and Zhang's (2015) ROE factor. However, our findings are novel in at least two respects. First,

[21] All NYSE, Amex, and Nasdaq stocks on the CRSP monthly file are ranked on the basis of cumulative prior-year returns (skip one month), and accordingly are assigned to ten deciles; stocks with the highest returns in the prior year are defined as winners while stocks with the lowest returns during the same period are defined as losers; the momentum strategy buys prior winners and sells prior losers; zero-investment winner-minus-loser portfolios are reconstructed at the start of each month, and held for one month; there is a one-month gap between portfolio formation and portfolio investing in order to avoid the mechanical bid-ask bias.

our measure of changes in profitability is based on firms' profits rather than on their ROE. As pointed out by the above-cited literature, a firm's income before extraordinary items includes several measures that have been documented to predict future stock returns yet are largely unrelated to true economic profitability.[22] Following this argument, if ROE and SMW both proxy for aggregate economic risk the profits-based SMW factor should be the cleaner proxy.[23] Second, our analysis in Section 3.3 shows that a firm's earnings surprises do not fully subsume the role of profitability growth in explaining average stock returns. Consequently, we expect that the profitability growth factor contains relevant information for the pricing of the cross section of stocks which is not already captured by a proxy for PEAD effects such as the change in ROE.

As a final exercise to better understand the sources of the PG effect, we examine the extent to which the *q*-factor model explains the returns to the PG strategy. We present the results in column (10) and (11) of Table 14. From specification (10), we see that the *q*-model appears to do a good job at explaining the average return to this strategy (the *q*-factor alpha is 0.25%, with *t*-value of 1.48) and at capturing the return variation over time (adjusted R-square is 30.39%). However, we know from the observations by Novy-Marx (2015a) that the ROE factor in the *q*-model conflates the effects of a lagged earnings and an earnings surprises factors. From our analysis in Section 3.3, the earnings surprises factor should be positively correlated with the return to our PG portfolio. Strictly speaking, the *q*-model relates expected earnings to expected stock returns, so earnings *surprises* should be relevant to this model only to the extent that they predict future earnings. Given the well-documented persistence in earnings, lagged earnings should be a good predictor of future earnings. If the *q*-theory were able to explain the PG effect, we would then expect that a slightly modified version of the *q*-model based on a lagged earnings factor (lagged-ROE) instead of the original earnings factor (ROE) still explains the average returns to the PG strategy—although possibly to a lesser extent than the original *q*-model. We test this hypothesis in model (11). We see that the pricing power of the modified *q*-model falls dramatically. The one-month alpha turns highly significant (*t*-value equal to 4.11) and of similar magnitude (0.76) as the Fama and French three-factor alpha in Table 5 (0.88). We conclude that the *q*-theory cannot account for the relation between profitability growth and stock returns. We discuss briefly alternative sources of the profitability growth effect on stock returns in Section 5.3.

[22] See footnote 2.

[23] As Novy-Marx (2013) puts it, "The farther down the income statement one goes, the more polluted profitability measures become."

5. Robustness and Further Analyses

In this section, we test the robustness of our findings to alternative profitability- growth measures, and examine the seasonal behavior of the profitability-growth strategy in more detail. We conclude the section by discussing alternative drivers of the returns to profitability growth.

5.1. Alternative profitability-growth measures

So far, we have defined our main variable of interest, profitability growth, as the year–over–year changes in operating profits scaled by the book value of equity. The numerator of this ratio is operating profits as defined by Fama and French (2015). The denominator, following the valuation Eq. (3) closely, is the book value of equity. We next verify that our results of Sections 2 and 3 still hold when we use alternative profit measures in the numerator, or an alternative deflator as the denominator, of the profitability-growth measure.

5.1.1. Alternative profit measures

Ball et al. (2015) propose an operating profits measure defined as revenue less cost of goods sold and selling, general, and administrative expenses, but not expenditures on research and developments (REVTQ–COGSQ–XSGAQ+XRDQ, obtained from the Compustat quarterly file). The authors argue that this alternative measure can better match current expenses with current revenues. According to their argument, research and development expenses should be subtracted because Compustat defines selling, general, and administrative expenses as the sum of firms' actual selling, general, and administrative expenses as well as their research and development expenses. Since research and development expenses reduce current profits while generating future revenues, eliminating their influence should lead to a cleaner measure of a firm's profit.

In Table 15, we repeat Table 4 above but using Ball et al.'s (2015) measure instead of our baseline operating-profits measure, with similar results. Panel A (B) presents EW (VW) monthly returns to the portfolios sorted on the profitability-growth measures constructed on the basis of Ball et al.'s definition of operating profits, along with the performance of the zero-cost profitability growth (strong minus weak) strategy, from the month immediately after portfolio formation to 24 months after. The EW (VW) spread between strong and weak profitability-growth firms is 1.11% with a *t*-statistic of 8.58 (0.67%, *t*–statistic of 3.92) for the month immediately after portfolio formation, and is comparable to the spread using our baseline profitability-growth measure.

[Insert Table 15 here]

In a separate analysis, we alternatively use Novy-Marx's (2013) gross profits to construct our profitability-growth measure (results shown in Appendix Table A3). The strong-gross profitability growth firms outperform the weak-gross profitability growth firms by 0.91% per month with a *t*–statistic of 7.55 for EW (0.70% per month, *t*–statistic of 3.98 for VW).

5.1.2. Alternative deflator

In the abovementioned analysis we have followed the valuation equation (3) by deflating profits by firm book equity. In this subsection, we follow Novy-Marx (2013) and Ball et al. (2015) in scaling profitability growth by total assets instead. Specifically, we redefine our month-*t* operating profitability growth (PG) measure as follows:

$$PG_q = (OP_{i,q} - OP_{i,q-4}) \big/ AT_{i,q-4}\,, \tag{10}$$

where $OP_{i,q}$ is the most-recent-quarter operating profits (revenues less cost of goods sold, selling, general and administrative expenses, minus interest expenses, REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items), $OP_{i,q-4}$ is the operating profits lagged four quarters, and $AT_{i,q-4}$ is the book value of total assets lagged four quarters. Ball et al. (2015) suggest that deflating profits by the book value of total assets is the product of the ratio of profits to the market value of equity, and the ratio of the market value of equity to the book value of total assets. Since the ratio of the market value of equity to the book value of total assets is priced (Fama and French, 1992), Ball et al. (2015) argue that the positive predictive power of asset-deflated profitability measures is confounded by the positive predictive power of the ratio of the market value of equity to the book value of total assets.

Table 16 reports the performance of profitability-growth-sorted EW (Panel A) and VW (Panel B) portfolios when firm growth is scaled by the book value of assets. The EW (VW) spread between strong and weak profitability-growth firms is 1.22%, with *t*–statistic of 9.60 (0.74%, *t*–statistic of 4.10) for the month immediately after portfolio formation. The profitability-growth effect is present for up to nine months after portfolio formation, with an EW (VW) monthly return of 0.29% and *t*–statistic of 2.64 (0.30%, *t*-statistic of 1.99). Both results are comparable to those obtained under our baseline deflator, book equity.

[Insert Table 16 here]

Overall, our results in this subsection suggest that the predictive power of profitability growth does not depend on the profitability measure or the profits deflator used in the analysis.

5.2. Seasonality analysis of the profitability-growth effects

A well-documented seasonal feature of the size anomaly—small firms earning higher returns than large firms (Banz, 1981)—is that half of the excess returns to small firms is concentrated in January (Keim, 1983). Since weak and strong profitability-growth firms tend to be relatively small, we show next that our results are not mechanically related to the January size effect (Rozeff and Kinney, 1976; Keim, 1986; Reinganum, 1983).

Panel B of Table 3 suggests that strong-growth firms tend to be relatively larger than weak-growth firms. According to Table 5, the strong-weak growth portfolio has negative loadings on the size (SMB) factor. The negative loading on the SMB factor indicates that this strategy bets *against* the January size effects and, as a result, may perform poorly in January.

[Insert Table 17 here]

To disentangle the impact of the January size effect on the profitability-growth strategy, we summarize the holding returns (for up to two years) to the four extreme decile portfolios (1, 2, 9, and 10) and the strong-weak portfolio in January versus February-to-December in Table 4. Strong-growth firms do not outperform weak-growth firms in January and may even underperform for certain holding horizons. By contrast, strong-growth firms strongly outperform from February to December. In January, the strong-weak growth strategy produces an EW (VW) average monthly return of –0.60%, with a *t*-statistic of –0.89 (–0.59%, *t*–statistic of –0.86) for the month immediately after portfolio formation. For the 12 months after portfolio formation, the EW (VW) average monthly return to this strategy is –1.76%, with a *t*-statistic of –2.67 (–0.73%, *t*–statistic of –1.07). In unreported results, we find that this January negative effect is present when we further control for firm size in double-sorted portfolios analyses similar to those of Section 3.2.

5.3. Potential drivers of the profitability-growth effect and limitations of our analysis

By examining the growth component of future profitability, our analysis integrates fundamental and price momentum effects within the unifying perspective on average stock returns provided by the firm valuation equation (3) and advocated by Fama and French (2006). By the same token, our analysis is subject to the same limitation as any test based (explicitly or implicitly) on the valuation equation alone, namely its lack of power to determine whether observed relations between average returns and firm characteristics such as book-to-market and profitability growth are due to rational or irrational pricing. We have presented evidence against profitability-growth spread returns being compensation for the risks that the factors in conventional pricing models might capture. However, our tests so far are unable to disentangle whether these returns are compensation for non-modelled risk or the result of irrational pricing.

To illustrate this limitation, we note that our results are as consistent with rational models such as that in Johnson (2002) as with the more behavioural argument, based on limited investor attention, in Da, Gurun and Warachka (2014). Indeed, Johnson (2002) explains underreaction anomalies such as momentum using a single-firm model with a standard pricing kernel in which shocks to the firm's growth rate are persistent and growth rate risk is priced—for reasons left outside of his analysis. In this model, the firm's stock price depends on the firm growth rate in a convex way, so the price of high-growth firms is highly sensitive—i.e., risky—to growth shock. Because growth is persistent, past growth predicts future risk and thus expected returns, much as we report in the previous sections. By contrast, Da, Gurun and Warachka (2014) hypothesize that investors are less attentive to information arriving continuously in small amounts than to information with the same cumulative price implication that arrives in large amounts at discrete points in time. Following this hypothesis, investors could miss a firm's recent steady path of profitability growth, so the firm's future stock returns could adjust only slowly and persistently over time. The higher significance of the profitability-growth effect on stock returns among steady growth companies that we report in subsection 3.3.2 is largely consistent with this type of effect. Thus, our results cannot distinguish whether (rationally) priced growth risk or limited investor attention, or a combination of the two, ultimately drives the profitability-growth effect on stock returns that we document. As such enquiry is outside the scope of our paper, we leave its examination for future work.

6. Conclusions

The valuation equation from the dividend-discount model provides a convenient framework to study the relation between a firm's profitability and its future returns, and potentially validates the use of profitability-based factors in empirical asset-pricing models. In this paper, we argue that simply accounting for the growth component of a firm's profitability can strengthen the empirical validity as well as applications of the valuation formula substantially.

Firm profitability growth is strongly persistent in the short term, rendering observed profitability growth a suitable proxy for future profitability. Consistent with the dividend discount model, profitability growth then predicts future stock returns even after controlling for current profitability and other well-known cross-sectional predictors. A profitability-growth strategy that buys strong-growth firms and sells weak-growth firms earns risk-adjusted returns in excess of 10% per year. In addition, profitability growth strategies can enhance the performance of size, book-to-market, profitability, and momentum strategies. Although a firm's profitability growth is (weakly) correlated with its standardized unexpected earnings, it is the steady, and thus largely unsurprising component of past growth which drives most of its effect on future returns. The return to the profitability-growth strategy can be further used as a pricing factor to capture the momentum anomaly, either alone or along with the typical factors (e.g., SMB) in standard empirical asset pricing models.

Our findings are robust across alternative definitions of profitability and to the use of alternative deflators of profitability changes. The profitability-growth effect is not confined to January, thus ruling out mechanical seasonal explanations. Overall, our findings help reconcile the valuation formula from the dividend-discount model with the data.

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Table 1. Fama-MacBeth Cross-sectional Regressions of Returns on Profitability Growth

Cross-sectional regressions are estimated each month from July 1975 to December 2014 of individual stock returns on profitability growth (profits scaled by book equity, PG), asset growth (the percentage change in total assets, I/A), firm size (market equity, log(ME)), book-to-market ratio (log(B/ME)), prior one-month returns (r_{01}), and prior two- to twelve-month returns ($r_{2,12}$). In Panel A, profitability growth is measured as the year–over–year changes of operating profits (revenues minus cost of goods sold, selling, general and administrative expenses, interest expenses, REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items) divided by book equity of four quarters ago. In Panel B, profitability growth is measured as the year-over-year changes of operating profits (revenue less cost of goods sold and selling, general, and administrative expenses but not expenditures on research and developments, REVTQ–COGSQ–XSGAQ+XRDQ) divided by book equity of four quarters ago. In Panel C, profitability growth is measured as the year-over-year changes of gross profits (revenue less cost of goods sold, REVTQ–COGSQ) divided by book equity of four quarters ago. P/BE(Q), the quarterly profitability-in-level measure, is defined as the corresponding profits in each panel divided by one-quarter lagged book equity. The profitability growth variables (constructed by using Compustat quarterly files) in the regression are in the months immediately after the most recent public quarterly earnings announcement dates (item RDQ) to ensure that the quarterly accounting variables are known before the returns they are assumed to explain. We require the fiscal quarter end that corresponds to its most recently announced quarterly earnings to be within 3 months prior to the portfolio formation. We impose this restriction to exclude stale profits data. P/BE(Y), the annual profitability-in-level measure, is defined as the corresponding profits (computed based on the corresponding Compustat annual items) from the fiscal year ending in calendar year t – 1 divided by book equity from the fiscal year ending in calendar year t – 1. Asset growth (I/A) is defined as the percentage change in total assets from the fiscal year ending in calendar year $t - 2$ to fiscal year ending in calendar year $t - 1$. Book-to-market ratio is defined as the book value of the equity from the fiscal year ending in calendar year t – 1 divided by market capitalization in June of year t. To ensure that the accounting variables are available before the returns they used to explain, we match the accounting data for all fiscal year ends in calendar year t – 1 with the returns for July of year t to June of year t + 1. The accounting explanatory variables in the regression for July of year t + 1 are for fiscal years ending in calendar year t. The regressions are estimated monthly, beginning in July of 1975. Independent variables are trimmed at the 0.5% and 99.5% levels. The reported statistics are reported in percentages and are the means of the time series of coefficients estimated from the month-by-month regressions. Corresponding t–statistics are reported in square brackets. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Stocks with market capitalization of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded.

	Panel A: Fama and French's (2015) operating profit				Panel B: Ball et al.'s (2015) operating profits				Panel C: Novy-Marx's (2013) gross profits			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PG	6.99		5.78	8.06	6.16		5.03	7.08	3.59		3.61	3.40
	[10.62]		[7.90]	[11.19]	[8.41]		[6.43]	[9.74]	[7.70]		[7.14]	[7.69]
P/BE(Q)		4.41	2.80			4.03	2.71			1.13	0.62	
		[7.67]	[4.52]			[8.73]	[5.70]			[5.77]	[2.91]	
P/BE(Y)				1.11				1.04				0.18
				[5.11]				[6.19]				[2.33]
I/A			–0.28	–0.41			–0.41	–0.41			–0.42	–0.42
			[–2.13]	[–2.78]			[–2.84]	[–2.74]			[–2.90]	[–2.90]
log(B/M)	0.27	0.31	0.27	0.33	0.28	0.33	0.28	0.34	0.33	0.30	0.29	0.30
	[3.23]	[3.63]	[3.30]	[3.97]	[3.52]	[3.89]	[3.47]	[4.00]	[4.11]	[3.47]	[3.62]	[3.58]
log(ME)	–0.15	–0.17	–0.16	–0.16	–0.13	–0.15	–0.15	–0.15	–0.12	–0.12	–0.13	–0.13
	[–3.78]	[–4.70]	[–4.59]	[–4.41]	[–3.47]	[–4.04]	[–4.41]	[–4.10]	[–3.23]	[–3.23]	[–3.37]	[–3.38]
$r_{0,1}$	–4.21	–4.21	–4.49	–4.46	–4.21	–4.15	–4.41	–4.39	–4.03	–4.02	–4.23	–4.33
	[–8.63]	[–8.82]	[–9.46]	[–9.30]	[–8.53]	[–8.51]	[–9.08]	[–9.07]	[–8.12]	[–8.25]	[–8.67]	[–8.90]
$r_{2,12}$	–0.02	0.09	–0.11	–0.13	0.03	0.13	–0.06	–0.07	0.08	0.20	0.00	–0.01
	[–0.11]	[0.46]	[–0.58]	[–0.65]	[0.13]	[0.63]	[–0.30]	[–0.29]	[0.40]	[0.98]	[0.00]	[–0.07]

Table 2. Regressions to Predict Profitability Growth

In Panel A, cross-sectional regressions are estimated at each fiscal quarter from the first fiscal quarter of 1976 to the last fiscal quarter of 2014 of profitability growth (PG, defined in Table 1) of firm *i* on its PGs, operating profitability in levels, book-to-market ratios, and asset growth of the prior one (-1), two (-2), and three (-3) quarters. In Panel B, cross-sectional regressions are estimated at each fiscal quarter from the first fiscal quarter of 1976 to the last fiscal quarter of 2014 of operating profitability level of firm *i* on its PGs, operating profitability in levels, book-to-market ratios, and asset growth of the prior one (-1), two (-2), and three (-3) quarters. Operating profitability (OP) is the quarterly profitability-in-level measure, is defined as most-recent-quarter operating profits of Fama and French (2015) divided by book equity. Asset growth (I/A) is defined as the percentage change in total assets from the previous quarter to the most recent quarter. Book-to-market ratios (BM) are defined as the most-recent-quarter book value of the equity of divided by market capitalization. Independent variables, including PG, OP, BM, and I/A, are trimmed at the 0.5% and 99.5% levels. The reported statistics are reported in percentage and are the means of the time series of coefficients estimated from the quarter-by-quarter regressions. Corresponding *t*–statistics are reported in square brackets. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Stocks with market capitalizations of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded.

	Panel A: Predict PG						Panel B: Predict P/BE					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PG(-1)	0.51			0.51	0.51	0.49	0.46			0.41	-0.01	0.06
	[38.04]			[37.49]	43.52	[16.89]	[27.73]			[20.73]	[-0.53]	[2.38]
PG(-2)		0.30		0.10		0.09		0.26		0.16		0.12
		[31.29]		[13.89]		[5.86]		[9.59]		[4.21]		[2.01]
PG(-3)			0.10	-0.07		0.05			0.13	0.05		-0.08
			[12.13]	[-11.72]		[3.88]			[8.39]	[4.05]		[-7.86]
OP(-1)					0.02	0.00					0.70	0.47
					[5.27]	[-0.08]					[48.50]	[29.90]
OP(-2)						0.02						0.05
						[1.57]						[5.98]
OP(-3)						-0.03						0.28
						[-5.29]						[24.78]
BM(-1)						-0.02						-0.02
						[-18.40]						[-17.67]
BM(-2)						0.00						0.01
						[4.61]						[4.68]
BM(-3)						0.01						0.01
						[14.97]						[14.27]
AG(-1)						0.01						0.00
						[7.17]						[2.50]
AG(-2)						-0.01						-0.00
						[-4.69]						[-3.17]
AG(-3)						0.00						0.00
						[-2.06]						[0.67]

Table 3. Summary Characteristics for Portfolios Classified by Profitability Growth

For each month *t*, NYSE, AMEX, and NASDAQ stocks with the share code of 10 or 11 are sorted into decile portfolios based on the most–recent–quarter operating profitability growth (PG) using NYSE breakpoints. Profitability growth is measured as the year-over-year changes of operating profits (revenues minus the cost of goods sold, selling, general and administrative expenses, interest expenses, REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items) divided by the book equity of the prior year. Book equity is shareholder equity, plus deferred taxes (Compustat item TXDITCQ), minus preferred stock (PSTKQ) if it is available. Stockholders' equity is as given in Compustat data item (SEQQ) if available, or else common /ordinary equity plus the carrying value of preferred stock (CEQQ+PSTKQ) if available, or else total assets minus total liabilities (ATQ–LTQ). Profit-related data in Compustat quarterly files are used in the portfolio sorts in the months immediately after the most recent public quarterly earnings announcement dates (item RDQ). We require the fiscal quarter end that corresponds to its most recently announced quarterly earnings to be within 3 months prior to the portfolio formation. We impose this restriction to exclude stale profits data. The P10 decile portfolio consists of the strong operating profitability growth firms, while the P1 decile portfolio consists of the weak operating profitability-growth firm. The book–to–market ratio is the ratio of 1-quarter-lagged book equity over the market capitalization of the previous month of portfolio formation. Market capitalization is the number of shares outstanding times the price (CRSP items SHROUT and PRC) as the previous month before portfolio formation. The operating profit-to-book equity ratio is the most-recent-quarter operating profit divided by 1-quarter-lagged book equity. Prior-six-month returns are the cumulative compounding returns in the previous seven months before portfolio formation with a one-month skip. Prior-year returns are the cumulative compounding returns in the prior year before the portfolio formation with a one-month skip. Stocks with market capitalizations of less than $25 million at the formulation month are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	P1 (Weak)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (Strong)
Panel A: Profitability growth (%)										
One quarter before										
EW	–7.52	0.23	1.43	2.34	2.09	2.93	2.90	3.13	4.46	13.23
VW	–3.68	–0.32	0.70	1.32	1.04	2.31	2.14	2.64	3.97	9.81
Most recent quarter										
EW	–12.00	–1.99	–0.79	–0.10	0.43	0.91	1.47	2.24	3.61	17.90
VW	–9.91	–1.95	–0.77	–0.09	0.43	0.92	1.47	2.23	3.60	11.50
One quarter after										
EW	–5.84	–1.07	0.16	0.09	0.48	0.78	1.15	1.75	2.68	10.47
VW	–5.79	–0.91	–0.30	0.12	0.50	0.88	1.17	1.81	2.76	7.39
Panel B: Market capitalization (in millions)										
Avg	1039	1852	2369	2940	3125	3444	3352	3057	2558	1744
Med	167	267	375	483	558	579	547	484	396	263
Panel C: Book–to–market ratio										
EW	0.88	0.97	0.97	0.95	0.88	0.80	0.75	0.69	0.65	0.55
VW	0.69	0.71	0.71	0.69	0.64	0.57	0.53	0.48	0.45	0.43
Panel D: Operating profit–to–book equity ratio (%)										
EW	–28.22	0.41	4.30	3.43	3.97	5.99	6.70	7.26	7.53	3.71
VW	–6.62	5.00	5.58	6.49	7.34	8.37	9.29	10.04	11.72	12.71
Panel E: Operating profit–to–asset ratio (%)										
EW	–5.70	–0.16	1.13	1.84	2.62	3.05	3.46	3.68	3.66	3.99
VW	–2.48	1.47	2.35	2.76	3.46	3.98	4.44	4.75	5.11	5.96
Panel F: Prior–six–month returns (%)										
EW	–1.82	1.30	3.83	5.99	7.67	9.36	11.85	14.28	17.67	24.12
VW	5.48	4.53	5.56	7.18	8.70	9.37	10.88	12.62	15.96	21.70
Panel G: Prior–year returns (%)										
EW	–3.11	0.57	5.23	9.00	12.51	15.90	20.61	25.74	33.19	47.44
VW	8.94	6.53	8.83	11.79	14.83	16.87	19.71	24.30	31.88	47.34

Table 4. Average Monthly Returns on Profitability-Growth Portfolios

This table shows the average monthly returns on ten portfolios sorted on operating profitability growth. For each month *t*, NYSE, AMEX, and NASDAQ stocks with the share code of 10 or 11 are sorted into decile portfolios based on the most-recent-quarter operating profitability growth using NYSE breakpoints. Profitability growth is measured as the year-over-year changes of operating profits (revenues minus cost of goods sold, selling, general and administrative expenses, interest expenses, REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items) divided by the book equity of four quarters ago. Book equity is shareholder equity, plus deferred taxes (Compustat item TXDITCQ), minus preferred stock (PSTKQ) if it is available. Stockholders' equity is as given in the Compustat data item (SEQQ) if available, or else common/ordinary equity plus the carrying value of preferred stock (CEQQ+PSTKQ) if available, or else total assets minus total liabilities (ATQ–LTQ). The P10 portfolio consists of the strong operating profitability growth firms while the P1 portfolio consists of the weak operating profitability-growth firm. The portfolios are held for the following month *t* +1 (M1), from month *t* +1 to *t* + 3 (M3), from month *t* +1 to *t* + 6 (M6), from month *t* +1 to *t* + 9 (M9), from month *t* +1 to *t* + 12 (M12), and from month *t* +1 to *t* + 24 (M24), respectively. This table reports the returns for these PG portfolios as well as the zero-investment strong-weak portfolio that takes a long position in P10 (the portfolio with the highest profitability growth) and takes a short position in P1 (the portfolio with the weakest profitability growth). Panel A reports equal-weighted returns and Panel B reports value-weighted returns, in percentages. Corresponding *t*-statistics are reported in square brackets. Stocks with market capitalization of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	P1 Weak	P2	P3	P4	P5	P6	P7	P8	P9	P10 Strong	Strong–Weak
Panel A: Equal–weighted portfolios											
M1	0.94	1.24	1.26	1.35	1.43	1.48	1.61	1.82	1.96	2.25	1.31
											[10.27]
M3	1.11	1.36	1.35	1.44	1.45	1.52	1.59	1.75	1.86	2.04	0.93
											[7.54]
M6	1.31	1.47	1.45	1.49	1.51	1.53	1.61	1.72	1.77	1.89	0.57
											[4.83]
M9	1.46	1.56	1.53	1.55	1.55	1.56	1.63	1.68	1.71	1.78	0.32
											[2.80]
M12	1.58	1.64	1.58	1.57	1.54	1.57	1.61	1.64	1.67	1.71	0.13
											[1.25]
M24	1.73	1.69	1.62	1.59	1.56	1.59	1.60	1.62	1.66	1.67	–0.06
											[–0.68]
Panel B: Value–weighted portfolios											
M1	0.69	0.94	0.97	1.11	1.12	1.06	1.03	1.23	1.31	1.44	0.75
											[4.50]
M3	0.73	1.06	1.04	1.09	1.10	1.12	1.08	1.13	1.25	1.32	0.59
											[3.63]
M6	0.75	1.12	1.10	1.11	1.07	1.16	1.16	1.12	1.21	1.32	0.57
											[3.79]
M9	0.80	1.13	1.13	1.13	1.12	1.18	1.20	1.16	1.17	1.27	0.47
											[3.31]
M12	0.85	1.15	1.17	1.14	1.13	1.18	1.17	1.16	1.17	1.23	0.37
											[2.74]
M24	0.99	1.16	1.16	1.18	1.15	1.21	1.17	1.15	1.15	1.21	0.22
											[1.90]

Table 5. Factor-Adjusted Returns of Profitability-Growth Portfolios

The portfolio construction is the same as defined in Table 4. P1 represents the decile of those stocks with weak profitability growth, and P10 represents the decile of those stocks with strong profitability growth, with strong-weak representing the zero-cost strong-minus-weak profitability-growth portfolio (holding for one month, i.e., M1 in Table 5). MKT is the monthly return to the market portfolio; SMB is the difference between the monthly returns on diversified portfolios of small and large stocks; HML is the difference between the monthly returns on a diversified portfolio of high and low B/M stocks; UMD is the difference between the monthly returns on diversified portfolios of winners and losers. RMW is the difference between the monthly returns on diversified portfolios with robust and weak profitability; CMA is the difference between the monthly return on diversified portfolios of low- and high-investment firms. The table reports α, $t(\alpha)$ and β estimated from a full-period regression of each decile portfolio monthly returns in excess of the risk-free rate (the returns to the strong-weak portfolio) on the three factors of Fama and French (1993), the four factors of Carhart (1997), and the five factors of Fama and French (2015), respectively. The *t*-statistics are reported in brackets. The sample period is 1975–2014.

	P1 (Weak)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (Strong)	P10–P1 strong-weak
A: Equal-weighted portfolios											
Fama-French three-factor model											
α	–0.52	–0.19	–0.10	0.02	0.15	0.21	0.34	0.52	0.61	0.84	1.36
$t(\alpha)$	[–4.13]	[–2.09]	[–1.31]	[0.32]	[2.16]	[3.25]	[5.35]	[7.62]	[8.37]	[8.39]	[11.19]
β_{MKT}	1.13	1.07	1.01	0.97	0.95	0.95	0.97	1.01	1.10	1.21	0.07
β_{SMB}	1.00	0.76	0.62	0.52	0.48	0.51	0.53	0.61	0.69	0.85	–0.15
β_{HML}	0.00	0.27	0.29	0.35	0.29	0.25	0.15	0.10	0.01	–0.16	–0.15
$adjR^2$	0.85	0.88	0.91	0.90	0.91	0.92	0.93	0.92	0.94	0.91	0.05
Carhart four-factor model											
α	–0.20	0.09	0.09	0.18	0.27	0.30	0.38	0.55	0.65	0.86	1.06
$t(\alpha)$	[–1.57]	[1.19]	[1.28]	[2.68]	[4.15]	[4.85]	[5.82]	[7.83]	[8.57]	[7.74]	[8.96]
β_{MKT}	1.06	1.01	0.97	0.94	0.92	0.93	0.96	1.00	1.09	1.20	0.14
β_{SMB}	1.03	0.79	0.63	0.54	0.49	0.51	0.53	0.61	0.69	0.86	–0.18
β_{HML}	–0.14	0.15	0.22	0.29	0.24	0.22	0.13	0.09	–0.01	–0.17	–0.03
β_{MOM}	–0.39	–0.34	–0.22	–0.19	–0.14	–0.11	–0.06	–0.04	–0.05	–0.03	0.36
$adjR^2$	0.91	0.94	0.94	0.93	0.92	0.93	0.93	0.93	0.94	0.91	0.35
Fama-French five-factor model											
α	–0.19	–0.03	–0.03	0.01	0.11	0.14	0.28	0.47	0.64	0.95	1.14
$t(\alpha)$	[–1.30]	[–0.28]	[–0.37]	[0.15]	[1.46]	[2.23]	[4.15]	[7.03]	[8.81]	[9.41]	[8.55]
β_{MKT}	1.06	1.03	0.98	0.97	0.95	0.96	0.98	1.02	1.09	1.18	0.12
β_{SMB}	0.85	0.69	0.61	0.55	0.51	0.55	0.57	0.64	0.70	0.81	–0.04
β_{HML}	0.05	0.26	0.26	0.27	0.19	0.14	0.03	–0.04	–0.07	–0.23	–0.29
β_{RMW}	–0.56	–0.27	–0.08	0.03	0.08	0.12	0.11	0.08	–0.02	–0.21	0.35
β_{CMA}	–0.30	–0.14	–0.10	0.04	0.08	0.10	0.11	0.13	–0.02	–0.03	0.27
$adjR^2$	0.87	0.89	0.91	0.91	0.92	0.93	0.94	0.93	0.94	0.91	0.11
Panel B: Value-weighted portfolios											
Fama-French three-factor model											
α	–0.52	–0.22	–0.16	0.08	0.13	0.04	0.01	0.26	0.31	0.36	0.88
$t(\alpha)$	[–4.15]	[–1.80]	[–1.56]	[0.86]	[1.59]	[0.46]	[0.10]	[3.08]	[3.26]	[3.26]	[5.33]
β_{MKT}	1.10	1.01	0.98	0.92	0.88	0.93	0.94	0.94	1.00	1.15	0.05
β_{SMB}	0.29	0.05	–0.01	–0.06	–0.14	–0.15	–0.11	–0.07	0.04	0.10	–0.19
β_{HML}	–0.09	0.16	0.17	0.07	0.08	0.07	0.03	–0.16	–0.30	–0.40	–0.32
$adjR^2$	0.80	0.76	0.79	0.82	0.83	0.85	0.87	0.85	0.85	0.85	0.07

Carhart four-factor model											
α	–0.31	–0.02	–0.03	0.19	0.16	0.04	–0.01	0.16	0.19	0.25	0.56
$t(\alpha)$	[–2.62]	[–0.17]	[–0.29]	[2.10]	[1.93]	[0.47]	[–0.15]	[1.95]	[2.10]	[2.22]	[3.60]
β_{MKT}	1.06	0.97	0.95	0.90	0.87	0.93	0.94	0.96	1.03	1.17	0.11
β_{SMB}	0.31	0.07	0.01	–0.05	–0.14	–0.15	–0.11	–0.08	0.03	0.09	–0.22
β_{HML}	–0.17	0.08	0.12	0.02	0.07	0.07	0.04	–0.12	–0.25	–0.36	–0.19
β_{MOM}	–0.25	–0.24	–0.15	–0.13	–0.04	0.00	0.02	0.12	0.14	0.13	0.38
$adjR^2$	0.83	0.80	0.81	0.83	0.83	0.85	0.87	0.86	0.87	0.86	0.27
Fama-French five-factor model											
α	–0.23	–0.16	–0.11	0.06	0.05	–0.08	–0.13	0.12	0.27	0.45	0.68
$t(\alpha)$	[–1.87]	[–1.17]	[–1.04]	[0.56]	[0.64]	[–1.00]	[–1.68]	[1.39]	[2.85]	[3.82]	[3.89]
β_{MKT}	1.04	1.00	0.96	0.93	0.90	0.95	0.97	0.97	1.01	1.12	0.08
β_{SMB}	0.15	0.02	–0.01	–0.07	–0.11	–0.09	–0.05	–0.03	0.07	0.09	–0.06
β_{HML}	0.07	0.20	0.25	0.02	0.05	0.02	–0.06	–0.30	–0.30	–0.32	–0.39
β_{RMW}	–0.48	–0.10	–0.03	–0.02	0.10	0.20	0.21	0.17	0.10	–0.08	0.39
β_{CMA}	–0.36	–0.07	–0.16	0.13	0.11	0.12	0.19	0.31	–0.03	–0.22	0.14
$adjR^2$	0.82	0.76	0.79	0.82	0.83	0.85	0.88	0.86	0.86	0.85	0.10

Table 6. Average Monthly Returns on Profitability Growth Portfolios: Control for Size

This table shows the equal- and value-weighted monthly returns to portfolios double sorted on first market equity and then profitability growth, and the results of time series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). *t* statistics are given in square brackets. The table also shows the average book-to-market ratio of each portfolio. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on CRSP and COMPUSTAT. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Small	2	3	4	Big	Small	2	3	4	Big
Panel A: Raw returns										
Weak	1.14	0.92	0.94	1.12	0.88	0.85	0.96	0.93	1.09	0.85
2	1.50	1.24	1.13	1.29	1.15	1.29	1.22	1.13	1.32	1.10
3	1.73	1.44	1.36	1.21	1.06	1.48	1.43	1.36	1.22	0.94
4	2.23	1.68	1.52	1.31	1.11	1.95	1.66	1.50	1.30	1.07
Strong	2.80	1.91	1.56	1.36	1.33	2.43	1.88	1.54	1.38	1.23
Strong-Weak	1.66	0.99	0.63	0.24	0.44	1.58	0.91	0.61	0.29	0.38
	[13.17]	[7.04]	[4.12]	[1.46]	[2.89]	[11.43]	[0.91]	[4.01]	[1.80]	[2.23]
Panel B: Factor-adjusted returns										
FF3	1.67	0.99	0.67	0.34	0.60	1.59	0.92	0.66	0.40	0.54
	[13.74]	[7.06]	[4.55]	[2.28]	[4.24]	[12.31]	[6.62]	[4.45]	[2.65]	[3.28]
Carhart	1.39	0.79	0.42	0.07	0.30	1.27	0.73	0.41	0.13	0.23
	[10.55]	[5.83]	[2.96]	[0.47]	[2.35]	[9.10]	[5.47]	[2.89]	[0.86]	[1.51]
FF5	1.42	0.77	0.54	0.20	0.54	1.32	0.71	0.54	0.27	0.43
	[10.28]	[5.29]	[3.50]	[1.33]	[3.68]	[8.78]	[4.90]	[3.51]	[1.80]	[2.32]
Panel C: Book-to-market ratios										
Weak	0.90	0.79	0.77	0.75	0.63	0.95	0.79	0.77	0.75	0.68
2	1.06	0.88	0.84	0.81	0.63	1.13	0.89	0.84	0.81	0.71
3	1.09	0.82	0.73	0.69	0.55	1.14	0.83	0.74	0.70	0.61
4	0.91	0.69	0.61	0.58	0.47	0.97	0.69	0.62	0.58	0.51
Strong	0.69	0.55	0.49	0.47	0.41	0.73	0.55	0.50	0.47	0.45

Table 7. Average Monthly Returns on Profitability-Growth Portfolios: Control for Book-to-Market Ratios

This table shows the equal- and value-weighted monthly returns to portfolios double sorted first on book–to–market ratios and then profitability growth, and results of time series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). *t* statistics are given in square brackets. The table also shows each the average market capitalizations of each portfolio. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on CRSP and COMPUSTAT. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Glamour	2	3	4	Value	Glamour	2	3	4	Value
Panel A: Raw returns										
Weak	0.75	0.86	1.02	1.23	1.50	0.60	0.92	1.18	0.92	1.03
2	1.04	1.14	1.11	1.33	1.75	0.91	1.10	1.08	1.26	1.44
3	1.22	1.40	1.39	1.51	1.89	1.02	1.20	1.17	0.96	1.48
4	1.63	1.62	1.72	1.81	1.97	1.35	1.09	1.24	1.41	1.55
Strong	1.98	2.19	2.17	2.33	2.82	1.43	1.34	1.11	1.46	1.68
Strong-Weak	1.23	1.33	1.15	1.09	1.32	0.83	0.42	–0.08	0.54	0.65
	[9.89]	[9.82]	[8.49]	[8.99]	[8.06]	[4.34]	[2.16]	[–0.39]	[2.92]	[2.75]
Panel B: Factor-adjusted returns										
FF3	1.20	1.32	1.09	1.06	1.40	0.87	0.39	–0.05	0.54	0.73
	[10.16]	[10.25]	[7.96]	[9.34]	[8.75]	[4.81]	[1.92]	[–0.27]	[2.86]	[3.08]
Carhart	1.06	1.12	0.92	0.88	1.10	0.63	0.16	–0.23	0.31	0.35
	[8.96]	[8.46]	[6.80]	[7.56]	[6.54]	[3.43]	[0.79]	[–1.11]	[1.66]	[1.49]
FF5	1.00	0.83	0.96	0.91	1.25	0.79	0.22	–0.11	0.37	0.54
	[8.73]	[6.42]	[6.92]	[7.94]	[6.63]	[3.91]	[1.12]	[–0.52]	[1.90]	[2.15]
Panel C: Market capitalizations										
Weak	2090	2385	1506	1008	472					
2	6467	3960	2688	1768	831					
3	6114	3790	2583	2024	1168					
4	4108	3049	2019	1527	1251					
Strong	2043	1564	1428	1079	650					

Table 8. Average Monthly Returns on Profitability-Growth Portfolios: Control for Momentum

This table shows the equal- and value-weighted monthly returns to portfolios double sorted first on momentum (prior-year returns, skip most-recent month) and then operating profitability growth, and the results of time-series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). Using NYSE breakpoints, winners are those stocks with the highest returns in the prior year while losers are those stocks with the lowest returns in the prior year. *t*-statistics are given in square brackets. The table also shows the market capitalizations and book-to-market ratios of each portfolio. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on CRSP and COMPUSTAT. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—i.e., those firms with one–digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Loser	2	3	4	Winner	Loser	2	3	4	Winner
Panel A: Raw returns										
Weak	0.73	0.77	0.97	1.04	1.25	0.42	0.85	0.89	1.12	1.22
2	1.31	1.22	1.20	1.23	1.56	1.12	1.21	1.08	1.07	1.21
3	1.31	1.29	1.36	1.48	1.77	1.00	0.97	1.21	1.17	1.29
4	1.38	1.43	1.56	1.62	2.02	1.08	1.11	1.09	1.21	1.66
Strong	1.51	1.59	1.73	1.84	2.27	1.17	1.00	1.18	1.21	1.76
Strong–Weak	0.78	0.82	0.75	0.80	1.03	0.75	0.15	0.29	0.09	0.54
	[5.57]	[7.38]	[6.68]	[6.89]	[7.76]	[3.74]	[0.86]	[1.66]	[0.55]	[2.83]
Panel B: Factor–adjusted returns										
FF3	0.84	0.82	0.76	0.79	0.96	0.87	0.30	0.44	0.15	0.60
	[6.16]	[7.87]	[6.59]	[6.98]	[7.92]	[4.28]	[1.80]	[2.50]	[0.89]	[3.28]
Carhart	0.82	0.84	0.78	0.83	0.99	0.85	0.32	0.35	0.17	0.62
	[5.20]	[8.01]	[6.83]	[7.31]	[7.92]	[3.97]	[1.94]	[1.90]	[1.03]	[3.35]
FF5	0.76	0.73	0.73	0.78	0.87	0.69	0.10	0.27	0.15	0.71
	[4.82]	[6.33]	[6.27]	[6.82]	[7.36]	[3.24]	[0.61]	[1.46]	[0.86]	[3.94]
Panel C: Book-to-market ratios and Market capitalizations										
Book-to-market ratios										
Weak	0.99	0.87	0.83	0.77	0.64	0.80	0.71	0.68	0.63	0.56
2	1.11	0.98	0.91	0.83	0.68	0.85	0.77	0.70	0.64	0.55
3	1.13	0.93	0.83	0.74	0.60	0.82	0.69	0.61	0.56	0.47
4	1.04	0.83	0.75	0.66	0.52	0.79	0.60	0.55	0.49	0.41
Strong	0.86	0.73	0.66	0.60	0.44	0.65	0.55	0.49	0.45	0.36
Market capitalizations										
Weak	643	1841	2562	2667	1792					
2	1098	2602	3628	3708	2949					
3	1478	3277	4081	4146	2910					
4	1763	3519	4132	4025	2489					
Strong	1157	2578	2950	2975	2027					

Table 9. Average Monthly Returns on Profitability-Growth Portfolios: Control for Profitability in Levels

This table shows the equal- and value-weighted monthly returns to portfolios double sorted first on profitability in level (i.e., operating profits divided by lagged book value of equity) and then profitability growth, and results of time series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). *t* statistics are given in square brackets. The table also shows the book-to-market ratios and market capitalization on each portfolio. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on CRSP and COMPUSTAT. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—those firms with one–digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Unprofitable	2	3	4	Profitable	Unprofitable	2	3	4	Profitable
Panel A: Raw returns										
Weak	0.88	1.11	1.29	1.31	1.44	0.56	1.07	1.16	1.29	1.09
2	1.12	1.23	1.34	1.38	1.56	0.75	0.95	0.90	1.17	1.09
3	1.24	1.38	1.37	1.51	1.80	0.81	1.07	1.13	1.03	1.33
4	1.39	1.55	1.70	1.71	1.94	1.02	1.24	1.10	1.29	1.38
Strong	1.97	1.88	1.89	2.06	2.42	1.12	1.22	1.09	1.29	1.63
Strong-Weak	1.09	0.77	0.60	0.75	0.98	0.56	0.15	-0.07	-0.01	0.54
	[9.35]	[5.57]	[4.19]	[4.61]	[5.53]	[3.35]	[0.74]	[-0.35]	[-0.02]	[2.24]
Panel B: Factor-adjusted returns										
FF3	1.10	0.85	0.69	0.76	0.93	0.58	0.22	-0.02	0.09	0.45
	[9.61]	[6.90]	[5.65]	[5.78]	[6.53]	[3.39]	[1.10]	[-0.12]	[0.45]	[2.08]
Carhart	0.92	0.67	0.52	0.53	0.68	0.46	-0.04	-0.15	-0.10	0.24
	[7.25]	[5.47]	[4.28]	[3.80]	[4.57]	[2.64]	[-0.22]	[-0.76]	[-0.50]	[1.12]
FF5	1.03	0.88	0.78	0.91	0.99	0.50	0.23	0.26	0.36	0.71
	[7.74]	[6.63]	[6.26]	[6.49]	[6.81]	[2.86]	[1.04]	[1.42]	[1.76]	[3.13]
Panel C: Market capitalizations and book-to-market ratio										
Book-to-market ratio										
Weak	0.84	0.93	0.83	0.70	0.58	0.71	0.77	0.65	0.56	0.45
2	1.05	1.02	0.83	0.66	0.51	0.88	0.88	0.66	0.51	0.39
3	1.15	1.03	0.81	0.63	0.49	0.98	0.90	0.65	0.47	0.35
4	1.10	0.97	0.75	0.61	0.47	0.96	0.84	0.63	0.48	0.35
Strong	0.81	0.87	0.74	0.60	0.43	0.69	0.75	0.62	0.50	0.35
Market capitalization										
Weak	652	1717	3033	3939	4552					
2	706	2038	3381	5599	7508					
3	839	2196	3458	5202	5870					
4	972	1946	2790	3974	4059					
Strong	653	1260	1818	2289	2099					

Table 10. Summary Characteristics for Profit Growth, Profit in Levels, and Standardized Unexpected Earnings

This table presents the time series average of the cross-sectional Pearson and Spearman correlations among three profitability growth (PG) measures, constructed based on the operating profits of Fama and French (2015), operating profits of Ball et al. (2015), gross profits of Novy-Marx (2013), the matching profitability in levels, and standardized unexpected earnings. Corresponding *t*-statistics are presented in square brackets. The PG is defined as the year-over-year changes in profits divided by the book equity of four quarters ago. Profitability in levels is defined as the profits divided by one-quarter lagged book equity. The standardized unexpected earnings (SUE) is defined the change of the earnings per share from the most recent quarter to four quarters ago, divided by the standard deviation of the change in earnings per share over the prior eight quarters. The PG variables, quarterly profitability in levels, and SUE in the regression are in the months immediately after the most recent public quarterly earnings announcement dates (item RDQ) to ensure that the quarterly accounting variables are available before the returns they used to explain. We require the fiscal quarter end that corresponds to its most recently announced quarterly earnings to be within three months prior to the portfolio formation. We impose this restriction to exclude stale profits data. All variables are trimmed at the 0.5% and 99.5% levels to mitigate the influence of outliers. The sample includes common stocks traded on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Stocks with market capitalization of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded.

	SUE	FF in levels	Ball in levels	Novy-Marx in levels
FF PG	0.31	0.34		
	[28.47]	[22.53]		
Ball PG	0.30		0.35	
	[26.77]		[24.06]	
Novy-Marx PG	0.25			0.30
	[25.77]			[20.12]

Table 11. Fama-MacBeth Cross-Sectional Regressions of Returns on Profitability Growth

Cross-sectional regressions are estimated each month from July 1975 to December 2014 of individual stock returns on profitability growth (PG), standardized unexpected earnings (SUE), asset growth (the percentage change in total assets, I/A), firm size (market equity, log (ME)), book-to-market ratio(log(B/ME)), prior one-month returns (r_{01}), and prior two-to-twelve-month returns($r_{2,12}$). In Panel A, profitability growth is measured as the year-over-year changes of operating profits (revenues minus cost of goods sold, selling, general and administrative expenses, interest expenses, REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items) divided by the book equity of four quarters ago. In Panel B, PG is measured as the year-over-year changes of operating profits (revenue less the cost of goods sold and selling, general, and administrative expenses but not expenditures on research and developments, REVTQ–COGSQ–XSGAQ+XRDQ) divided by the book equity of four quarters ago. In Panel C, PG is measured as the year-over-year changes of gross profits (i.e., revenue less cost of goods sold, REVTQ–COGSQ, obtained from Compustat quarterly items) divided by the book equity of four quarters ago. SUE is defined as the change of the earnings per share from the most recent quarter to four quarters ago, divided by the standard deviation of the change in earnings per share over the prior eight quarters. PG and SUE, (which are constructed by using Compustat quarterly files) in the regression are in the months immediately after the most recent public quarterly earnings announcement dates (item RDQ) to ensure that the quarterly accounting variables are available before the returns they used to explain. We require the fiscal quarter end that corresponds to its most recently announced quarterly earnings to be within three months prior to the portfolio formation. We impose this restriction to exclude stale profits data. Asset growth (I/A) is defined as the percentage change in total assets from the fiscal year ending in calendar year $t - 2$ to the fiscal year ending in calendar year $t - 1$. Book-to-market ratio is defined as the book value of the equity from the fiscal year ending in calendar year t – 1 divided by market capitalization in June of year t. To ensure that the accounting variables are available before the returns they used to explain, we match the accounting data for all fiscal year ends in calendar year t – 1 with the returns for July of year t to June of year t + 1. The accounting explanatory variables in the regression for July of year t + 1 are for fiscal years ending in calendar year t. The regressions are estimated monthly, beginning in July of 1975. Independent variables are trimmed at the 0.5% and 99.5% levels. The reported statistics are reported in percentages and are the means of the time series of coefficients estimated from the month-by-month regressions. Corresponding [t–statistics] are reported in square brackets. All independent variables are trimmed at the 0.5% and 99.5% levels to mitigate the influence of outliers. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on CRSP and COMPUSTAT. Stocks with market capitalization of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded.

	Panel A: Fama and French (2015)	Panel B: Ball et al. (2015)	Panel C: Novy-Marx (2013)
PG	3.72	3.05	1.88
	[2.76]	[2.12]	[2.23]
SUE	0.20	0.21	0.20
	[8.72]	[8.91]	[10.55]
I/A	-0.28	-0.29	-0.27
	[-1.11]	[-1.23]	[-1.14]
log(B/M)	0.31	0.33	0.35
	[3.71]	[3.88]	[4.03]
log(ME)	-0.16	-0.16	-0.16
	[-4.07]	[-4.01]	[-3.81]
$r_{0,1}$	-4.81	-4.73	-4.75
	[-8.79]	[-8.64]	[-9.02]
$r_{2,12}$	-0.33	-0.35	-0.28
	[-1.45]	[-1.54]	[-1.29]

Table 12. Average Monthly Returns on Profitability-Growth Portfolios: Control for SUE

This table shows the equal- and value-weighted monthly returns to portfolios double sorted first on SUE (defined in Table 10 and 11) and then operating profitability growth, and the results of time-series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). *t*-statistics are given in square brackets. The table also shows the market capitalizations and book-to-market ratios of each portfolio. The sample includes common stocks traded on NYSE, AMEX, and Nasdaq with coverage on CRSP and COMPUSTAT. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—i.e., those firms with one–digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Low-SUE	2	3	4	High-SUE	Low-SUE	2	3	4	High-SUE
Panel A: Raw returns										
Weak	0.98	1.35	1.30	1.48	1.64	0.57	1.09	1.06	1.24	1.10
2	1.06	1.20	1.36	1.55	1.54	0.94	1.01	1.07	1.25	1.11
3	1.20	1.24	1.52	1.68	1.85	1.00	1.02	1.05	1.12	1.23
4	1.25	1.31	1.62	1.65	2.17	0.89	1.03	1.25	1.29	1.59
Strong	1.36	1.46	1.91	2.19	2.40	1.02	1.11	1.17	1.40	1.57
Strong–Weak	0.38	0.11	0.61	0.71	0.77	0.45	0.02	0.11	0.16	0.47
	[2.12]	[0.66]	[4.08]	[3.86]	[4.34]	[2.12]	[0.13]	[0.50]	[0.64]	[1.92]
Panel B: Factor–adjusted returns										
FF3	0.55	0.26	0.60	0.60	0.67	0.75	0.20	0.12	0.09	0.34
	[3.19]	[1.72]	[4.40]	[3.94]	[4.56]	[3.62]	[0.99]	[0.58]	[0.37]	[1.49]
Carhart	0.34	0.03	0.44	0.47	0.56	0.51	-0.11	-0.03	-0.12	0.13
	[1.93]	[0.20]	[3.23]	[3.18]	[3.74]	[2.49]	[-0.55]	[-0.15]	[-0.49]	[0.57]
FF5	0.30	0.05	0.54	0.65	0.83	0.51	0.04	0.22	0.19	0.56
	[1.55]	[0.29]	[3.89]	[4.06]	[5.56]	[2.23]	[0.19]	[0.98]	[0.72]	[2.38]
Panel C: Book-to-market ratios and Market capitalizations										
Book-to-market ratios										
Weak	0.95	0.88	0.88	0.84	0.76	0.74	0.69	0.67	0.64	0.54
2	1.00	0.98	0.89	0.79	0.62	0.77	0.75	0.70	0.59	0.44
3	1.01	0.97	0.84	0.74	0.58	0.77	0.75	0.63	0.54	0.41
4	1.00	0.90	0.81	0.70	0.55	0.77	0.71	0.59	0.53	0.36
Strong	0.86	0.78	0.69	0.60	0.52	0.66	0.64	0.54	0.48	0.38
Market capitalizations										
Weak	1129	1366	2616	3494	4474					
2	1674	2062	2786	3914	5173					
3	2104	2320	2687	3180	4606					
4	2762	2534	2846	2681	3755					
Strong	3388	2477	1881	1882	2403					

Table 13: Steady vs. Dramatic Profitability Growth

At each month *t*, NYSE, AMEX, and NASDAQ stocks with the share code of 10 or 11 are sorted into quintile portfolios (i.e., P1… P5) based on the most-recent-quarter operating profitability growth (PG) using NYSE breakpoints. PG is measured as the most-recent-quarter year-over-year changes of profits divided by the book equity of four quarters ago. We use three PG measures, constructed based on the operating profits of Fama and French (2015), operating profits of Ball et al. (2015), gross profits of Novy-Marx (2013), the matching profitability in levels, and standardized unexpected earnings. The P5 portfolio consists of those firms with strong profitability growth while the P1 portfolio consists of those firms with weak profitability growth. The portfolios are held for one month. The table reports the average monthly returns to the profitability-growth quintile portfolios as well as the returns to the strong-minus-weak (P5–P1) PG portfolios. Further, for most recent five quarters, we compute five corresponding PG measures, i.e., PG_{q-1}, PG_{q-2}, PG_{q-3}, PG_{q-4}, and PG_{q-5}. If there is an increase in PG from quarter Q-2 to Q-1, then $Dummy_1$ equals 1 else $Dummy_1$ equals -1. Using similar logic, we define $Dummy_2$, $Dummy_3$, and $Dummy_4$. The sum of all the dummies within a year is defined as Dummy, which ranges from -4 to 4. Strong- and weak-PG firms are divided into two groups. Among strong-PG (respectively, weak-PG) firms, the "steady" group is made up of all firms Dummy>=0 (Dummy<=0) whereas the "dramatic" group is made up of all firms with Dummy<0 (Dummy>0). The table reports the monthly returns to the long-short steady growth portfolio ($P5_S$-$P1_S$) and the long-short dramatic growth portfolio ($P5_D$-$P1_D$). Stocks with market capitalization of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	FF	Ball et al	Novy-Marx		FF	Ball et al	Novy-Marx
			Panel A: Equal-weighted portfolios				
				$P1_S$	1.16	1.20	1.27
P1	1.17	1.20	1.28	(Steady)	(3.98)	(4.10)	(4.43)
(Weak)	(3.98)	(4.10)	(4.43)	$P1_D$	1.30	1.15	1.34
				(Dramatic)	(3.57)	(3.40)	(3.98)
				$P5_S$	2.18	2.12	2.02
P5	2.15	2.08	1.96	(Steady)	(7.38)	(7.12)	(6.88)
(Strong)	(7.29)	(6.98)	(6.68)	$P5_D$	1.76	1.69	1.49
				(Dramatic)	(5.82)	(5.42)	(4.88)
				$P5_S$-$P1_S$	1.02	0.92	0.75
P5-P1	0.98	0.88	0.68	(Steady)	(8.71)	(7.77)	(6.42)
(SMW)	(8.38)	(7.46)	(5.86)	$P5_D$-$P1_D$	0.58	0.61	0.22
				(Dramatic)	(2.53)	(2.95)	(1.06)
			Panel B: Value-weighted portfolios				
				$P1_S$	0.88	0.93	0.98
P1	0.89	0.93	0.98	(Steady)	(3.67)	(3.90)	(4.10)
(Weak)	(3.70)	(3.93)	(4.14)	$P1_D$	1.11	1.02	1.07
				(Dramatic)	(3.24)	(3.10)	(3.32)
				$P5_S$	1.43	1.37	1.38
P5	1.40	1.37	1.34	(Steady)	(5.68)	(5.49)	(5.68)
(Strong)	(5.55)	(5.44)	(5.43)	$P5_D$	1.32	1.41	1.14
				(Dramatic)	(4.26)	(4.73)	(3.73)
				$P5_S$-$P1_S$	0.55	0.44	0.40
P5-P1	0.51	0.44	0.35	(Steady)	(3.43)	(2.78)	(2.50)
(SMW)	(3.13)	(2.67)	(2.22)	$P5_D$-$P1_D$	0.33	0.50	0.14
				(Dramatic)	(1.08)	(1.71)	(0.48)

Table 14. Factor-Adjusted Returns of Momentum and Profitability Growth Portfolios

The table presents the intercept (α) and loadings of regressions of momentum (i.e., winner-minus-loser) and profitability growth (PG) (i.e., strong-minus-weak) portfolios on the Fama and French's (2015) five factors, the Hou, Xue, and Zhang's (2015) four factors, and the strong-minus-weak (SMW) PG factor. The momentum strategy is constructed in the following: All NYSE, Amex and Nasdaq stocks on the monthly file of CRSP are ranked on the basis of cumulative prior-year returns (skip one month), and accordingly are assigned to ten deciles; stocks with the highest returns in the prior year are defined as winners, while stocks with the lowest returns during the same period are defined as losers; the momentum strategy buys prior winners and sells prior losers; zero-investment winner-minus-loser portfolios are reconstructed at the start of each month, and held for one month; there is a one-month gap between portfolio formation and portfolio investing to avoid the mechanical bid-ask bias. In Panel A, Fama and French's (2015) five factors are as follow: MKT is the monthly return to the market portfolio excess of the risk-free rate (i.e., one-month Treasury bills); SMB is the difference between the monthly returns on diversified portfolios of small and large stocks; HML is the difference between the monthly returns on a diversified portfolio of high and low B/M stocks; RMW is the difference between the monthly returns on diversified portfolios with robust and weak profitability; CMA is the difference between the monthly return on a diversified portfolios of low- and high-investment firms. In Panel B, Hou, Xue, and Zhang's (2015) four factors are as follows: MKT is the monthly return to the market portfolio excess of the risk-free rate (i.e., one-month Treasury bills); ME is the difference between the monthly returns on diversified portfolios of small and large stocks; ROE is the difference between the monthly returns on a diversified portfolio of high- and low-ROE stocks; I/A is the difference between the monthly return on a diversified portfolios of low- and high-investment firms. Further, we follow Fama and French (2015), and Hou, Xue, and Zhang (2015) to construct the SMW factor. Specifically, at each month we use the median NYSE size breakpoints to split NYSE, Amex, and Nasdaq stocks into two groups, small and big; independently, at each month, we assign all stocks into three PG groups, using the NYSE breakpoints for the weak 30%, middle 40%, and strong 30% of the ranked values of most-recent-quarter PG; we require most-recent-quarter PG to be within three months prior to the portfolio formation; then we take the intersections of the two size and three PG groups to form the value-weighted SMW portfolio (i.e., ½(big/strong+small/strong)- ½ (big/weak+small/weak)). We also construct a lagged-ROE factor in the similar fashion, given that the ROE factor in the *q*-model can be decomposed into lagged ROE levels and current ROE changes, with changes in ROE proxying for earnings surprises (Novy-Marx, 2015a). The sample period covers January 1975 to December 2014.

	Panel A: Fama and French (2015)							Panel B: Hou, Xue, and Zhang (2015)				
	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)
	Dependent variable											
	MOM	*MOM*	*MOM*	*MOM*	*MOM*	*MOM*		*MOM*	*MOM*	*MOM*	*PG*	*PG*
α	1.31***	1.53***	0.99***	-0.05	0.14	-0.03	α	0.20	-0.15	-0.01	0.25	0.76***
	[4.15]	[4.73]	[2.62]	[-0.15]	[0.44]	[-0.08]		[0.52]	[-0.48]	[-0.04]	[1.48]	[4.11]
MKT	-0.24**	-0.36***	-0.22**		-0.43***	-0.35***	MKT	-0.15*	-0.31***	-0.40***	0.13***	0.08
	[-2.29]	[-3.20]	[-1.98]		[-4.57]	[-3.95]		[-1.79]	[-3.60]	[-4.21]	[3.41]	[1.45]
SMB		0.10	0.26		0.20	0.21	ME	0.60***	0.40***	0.24	0.09	-0.05
		[0.63]	[1.61]		[1.49]	[1.57]		[3.71]	[2.81]	[1.74]	[1.28]	[-0.55]
HML		-0.51***	-1.04***		-0.07	-0.40**	IA	-0.07	0.16	0.18	-0.20***	-0.22*
		[-2.69]	[-4.29]		[-0.42]	[-2.06]		[-0.24]	[0.51]	[0.77]	[-2.09]	[-1.76]
RMW			0.73***			0.15	ROE	1.56***	0.68***		0.81***	
			[3.18]			[0.74]		[7.59]	[3.08]		[9.83]	
CMA			1.07***			0.71***						
			[2.83]			[2.56]						
SMW				1.81***	1.90***	1.83***	SMW		1.43***	1.93***		
				[8.73]	[9.07]	[9.15]			[6.24]	[9.72]		
							Lagged-ROE					-0.16
												[-1.61]
Adj. R^2	2.1%	6.1%	12.3%	32.9%	37.7%	39.2%	Adj. R^2	30.4%	41.0%	38.2%	30.4%	2.3%

Table 15. Average Monthly Returns on Profitability Growth Portfolios: Ball et al.'s (2015)'s Measure

For each month *t*, NYSE, AMEX, and NASDAQ stocks with the share code of 10 or 11 are sorted into decile portfolios based on the most-recent-quarter operating profitability growth (PG) using NYSE breakpoints. Profitability growth is measured as the year-over-year changes of operating profits (i.e., revenue less cost of goods sold and selling, general, and administrative expenses but not expenditures on research and developments, REVTQ–COGSQ–XSGAQ+XRDQ, obtained from Compustat quarterly items), scaled by book equity lagged four quarters. Book equity is shareholder equity, plus deferred taxes (Compustat item TXDITCQ), minus preferred stock (PSTKQ) if it is available. Stockholders' equity is as given in Compustat data item (SEQQ) if available, or else common/ordinary equity plus the carrying value of preferred stock (CEQQ+PSTKQ) if available, or else total assets minus total liabilities (ATQ–LTQ). The P10 decile portfolio consists of the strong operating profitability-growth firms while the P1 decile portfolio consists of the weak operating profitability-growth firm. The portfolios are held for the following month *t* +1(M1), from month *t* +1 to *t* + 3 (M3), from month *t* +1 to *t* + 6 (M6), from month *t* +1 to *t* + 9 (M9), from month *t* +1 to *t* + 12 (M12), from month *t* +1 to *t* + 24 (M24), respectively. This table reports the returns for these PG portfolios as well as the zero-investment portfolio strong-weak (strong-minus-weak profitability growth) that takes a long position in P10 (the portfolio with strong operating profitability growth) and takes a short position in P1 (the portfolio with the weak operating profitability growth). [*t*–statistics] are reported correspondingly. Stocks with market capitalization of less than $25 million are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	P1 Strong	P2	P3	P4	P5	P6	P7	P8	P9	P10 Weak	Strong-Weak
Panel A: Equal-weighted portfolios											
M1	1.01	1.25	1.27	1.43	1.42	1.53	1.59	1.82	1.89	2.12	1.11
											[8.58]
M3	1.16	1.35	1.40	1.47	1.46	1.53	1.59	1.75	1.78	1.94	0.78
											[6.17]
M6	1.35	1.48	1.50	1.53	1.54	1.54	1.59	1.72	1.73	1.80	0.45
											[3.67]
M9	1.49	1.57	1.58	1.58	1.57	1.56	1.60	1.68	1.69	1.71	0.22
											[1.89]
M12	1.60	1.64	1.61	1.60	1.58	1.56	1.60	1.64	1.65	1.66	0.05
											[0.49]
M24	1.74	1.70	1.64	1.61	1.58	1.58	1.61	1.63	1.64	1.64	–0.10
											[–1.19]
Panel B: Value-weighted portfolios											
M1	0.74	0.99	1.03	1.12	1.12	1.05	1.11	1.15	1.26	1.41	0.67
											[3.92]
M3	0.81	1.09	1.09	1.08	1.11	1.13	1.13	1.11	1.22	1.28	0.47
											[2.82]
M6	0.87	1.11	1.13	1.09	1.11	1.17	1.17	1.11	1.19	1.30	0.43
											[2.73]
M9	0.93	1.13	1.19	1.13	1.12	1.19	1.22	1.13	1.16	1.25	0.32
											[2.15]
M12	0.97	1.15	1.18	1.14	1.13	1.19	1.20	1.14	1.14	1.21	0.24
											[1.73]
M24	1.05	1.16	1.16	1.17	1.16	1.20	1.21	1.15	1.12	1.21	0.16
											[1.39]

Table 16. Average Monthly Returns on Profitability-Growth Portfolios: Deflating by Assets Measure

For each month *t*, NYSE, AMEX, and NASDAQ stocks with the share code of 10 or 11 are sorted into decile portfolios based on the most-recent-quarter operating profitability growth (PG) using NYSE breakpoints. Profitability growth is measured as the year-over-year changes of operating profits (revenues minus cost of goods sold, selling, general and administrative expenses, interest expenses, REVTQ–COGSQ–XSGAQ–XINTQ, obtained from Compustat quarterly items) divided by total assets (ATQ, obtained from Compustat quarterly items) of the prior year. The P10 decile portfolio consists of the strong operating profitability growth firms while the P1 decile portfolio consists of the weak operating profitability growth firm. The portfolios are held for the following month *t* +1(M1), from month *t* +1 to *t* + 3 (M3), from month *t* +1 to *t* + 6 (M6), from month *t* +1 to *t* + 9 (M9), from month *t* +1 to *t* + 12 (M12), from month *t* +1 to *t* + 24 (M24), respectively. This table reports the returns for these PG portfolios as well as the zero–investment portfolio *Strong-Weak* (strong-minus-weak profitability growth) that takes a long position in P10 (the portfolio with strong operating profitability growth) and takes a short position in P1 (the portfolio with the weak operating profitability growth). Panel A presents equal–weighted returns and Panel B presents value–weighted returns, in percentage. [*t*–statistics] are reported correspondingly. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period starts from January 1975 to December 2014.

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Strong–Weak
Panel A: Equal-weighted portfolios											
M1	0.98	1.16	1.21	1.42	1.44	1.50	1.63	1.78	1.95	2.20	1.22
											[9.60]
M3	1.15	1.29	1.27	1.46	1.50	1.59	1.60	1.72	1.81	2.01	0.87
											[7.31]
M6	1.33	1.43	1.38	1.51	1.54	1.61	1.61	1.72	1.76	1.85	0.52
											[4.55]
M9	1.47	1.53	1.47	1.56	1.56	1.62	1.65	1.68	1.70	1.76	0.29
											[2.64]
M12	1.60	1.60	1.52	1.57	1.57	1.61	1.63	1.66	1.64	1.71	0.11
											[1.05]
M24	1.73	1.64	1.58	1.60	1.59	1.62	1.62	1.64	1.63	1.69	–0.04
											[–0.43]
Panel B: Value-weighted portfolios											
M1	0.73	0.93	0.89	1.21	1.07	1.07	1.17	1.13	1.32	1.47	0.74
											[4.10]
M3	0.83	1.02	0.96	1.14	1.16	1.17	1.13	1.16	1.28	1.30	0.47
											[2.74]
M6	0.85	1.08	1.03	1.13	1.12	1.20	1.19	1.17	1.27	1.26	0.41
											[2.61]
M9	0.90	1.10	1.06	1.14	1.13	1.23	1.22	1.17	1.23	1.20	0.30
											[1.99]
M12	0.92	1.14	1.09	1.17	1.12	1.22	1.20	1.16	1.18	1.18	0.26
											[1.78]
M24	1.02	1.13	1.14	1.21	1.14	1.22	1.18	1.16	1.16	1.21	0.18
											[1.53]

Table 17. Average Monthly Returns on Profitability-Growth Portfolios: Control for January Seasonality

The portfolio construction is the same as defined in Table 2. P1 represents the decile of those stocks with weak profitability growth and P10 represents the decile of those stocks with strong profitability growth, with strong-weak representing the zero-cost strong-weak profitability growth portfolio. The portfolios are held for the following month *t* +1 (M1), from month *t* +1 to *t* + 3 (M3), from month *t* +1 to *t* + 6 (M6), from month *t* +1 to *t* + 9 (M9), from month *t* +1 to *t* + 12 (M12), from month *t* +1 to *t* + 24 (M24), respectively. This table reports the returns for these GP portfolios as well as the zero-investment, strong-weak (strong-weak profitability growth) portfolio that takes a long position in P10 (the portfolio with the highest profitability growth) and takes a short position in P1 (the portfolio with the weakest profitability growth). The results for the month of January, and February to December, are reported separately. Panel A presents equal-weighted returns and Panel B presents value-weighted returns, in percentage. [*t*–statistics] are reported correspondingly. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—i.e., those firms with one-digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	P1 (Weak)	P2	P9	P10 (Strong)	Strong-Weak	P1 (Weak)	P2	P9	P10 (Strong)	Strong-Weak
	January					February–December				
Panel A: Equal-weighted portfolios										
M1	5.32	3.94	3.54	4.72	–0.60	0.54	1.00	1.82	2.03	1.49
					[–0.89]					[12.21]
M3	5.56	4.09	3.44	4.66	–0.90	0.70	1.11	1.71	1.80	1.10
					[–1.25]					[9.57]
M6	5.93	4.29	3.30	4.67	–1.26	0.89	1.22	1.63	1.63	0.74
					[–1.72]					[6.87]
M9	6.15	4.42	3.23	4.50	–1.64	1.03	1.30	1.57	1.53	0.50
					[–2.24]					[4.91]
M12	6.20	4.49	3.24	4.44	–1.76	1.16	1.38	1.53	1.46	0.30
					[–2.67]					[3.15]
M24	6.22	4.50	3.31	4.45	–1.77	1.32	1.43	1.51	1.42	0.10
					[–3.89]					[1.25]
Panel B: Value-weighted portfolios										
M1	2.71	2.61	1.63	2.12	–0.59	0.50	0.79	1.28	1.38	0.88
					[–0.86]					[5.15]
M3	2.79	2.95	1.56	2.25	–0.54	0.54	0.89	1.22	1.23	0.69
					[–0.73]					[4.25]
M6	2.79	3.17	1.52	2.43	–0.34	0.56	0.94	1.18	1.21	0.65
					[–0.48]					[4.34]
M9	3.03	2.94	1.55	2.39	–0.64	0.60	0.96	1.14	1.17	0.57
					[–0.89]					[4.08]
M12	2.99	2.78	1.64	2.26	–0.73	0.66	1.00	1.13	1.13	.0.47
					[–1.07]					[3.54]
M24	2.96	2.41	1.87	2.60	–0.36	0.81	1.04	1.08	1.08	0.27
					[–0.78]					[2.29]

Appendix

Table A1. Average Monthly Returns on Profitability-Growth Portfolios: Control for Ball et al.'s Profitability in Levels

This table shows the equal- and value-weighted monthly returns to portfolios double sorted first on profitability in level (i.e., Ball's operating profits divided by lagged book value of equity) and then profitability growth, and results of time-series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). *t* statistics are given in square brackets. The table also shows the market capitalizations and book-to-market ratios of each portfolio. The sample includes common stocks traded on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Stocks with market capitalizations of less than $25 million at the formation month are excluded. Financial firms—those firms with one–digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Unprofitable	2	3	4	Profitable	Unprofitable	2	3	4	Profitable
Panel A: Raw returns										
Weak	0.86	1.14	1.46	1.45	1.53	0.56	0.97	1.09	1.29	1.18
2	1.10	1.29	1.37	1.38	1.80	0.61	1.10	1.10	1.06	1.12
3	1.18	1.34	1.54	1.58	2.07	0.84	1.19	1.09	0.98	1.42
4	1.40	1.60	1.58	1.68	1.96	0.91	1.28	1.09	1.14	1.38
Strong	1.78	1.76	1.88	1.85	2.38	1.04	1.10	1.19	1.17	1.61
Strong–Weak	0.91	0.63	0.42	0.40	0.85	0.48	0.13	0.09	-0.12	0.43
	[7.30]	[4.86]	[2.97]	[2.54]	[4.80]	[2.17]	[0.67]	[0.47]	[-0.57]	[1.78]
Panel B: Factor-adjusted returns										
FF3	0.95	0.68	0.48	0.50	0.91	0.54	0.22	0.06	0.06	0.45
	[7.89]	[5.51]	[3.80]	[3.86]	[6.46]	[2.84]	[1.11]	[0.29]	[0.31]	[2.13]
Carhart	0.77	0.52	0.32	0.27	0.66	0.37	0.02	-0.12	-0.15	0.19
	[5.58]	[4.30]	[2.48]	[2.19]	[4.45]	[1.87]	[0.12]	[-0.60]	[-0.79]	[0.92]
FF5	0.85	0.69	0.52	0.52	0.98	0.45	0.28	0.13	0.20	0.73
	[5.88]	[5.45]	[3.97]	[3.70]	[6.74]	[2.26]	[1.38]	[0.61]	[0.99]	[3.32]
Panel C: Market capitalizations and book-to-market ratio										
Book-to-market ratio										
Weak	0.88	0.95	0.83	0.75	0.62	0.73	0.79	0.67	0.59	0.49
2	1.07	1.01	0.84	0.68	0.56	0.92	0.86	0.66	0.52	0.41
3	1.14	0.98	0.79	0.63	0.52	0.99	0.85	0.63	0.48	0.37
4	1.07	0.91	0.74	0.62	0.49	0.94	0.80	0.60	0.47	0.36
Strong	0.82	0.83	0.72	0.6	0.43	0.70	0.72	0.60	0.49	0.36
Market capitalizations										
Weak	662	1651	2883	3453	3455					
2	672	2013	3442	5552	6832					
3	861	2191	3370	4790	6093					
4	959	1850	2588	3900	4077					
Strong	716	1190	1695	2256	2093					

Table A2. Average Monthly Returns on Profitability-Growth Portfolios: Control for Novy-Marx's Profitability in Levels

This table shows the equal- and value-weighted monthly returns to portfolios double sorted first on profitability in level (i.e., gross profits divided by lagged book value of equity) and then profitability growth, and results of time series regressions of sorts' strong-weak growth portfolios' returns on the Fama and French factors (the market, size, value, profitability, and investment factors MKT, SMB, HML, RMW, CMA), and the Carhart factors (the market, size, value, and momentum factors, MKT, SMB, HML, MOM). *t* statistics are given in square brackets. The table also shows the market capitalizations and book-to-market ratios of each portfolio. The sample includes common stocks traded on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq with coverage on the Center for Research in Security Prices (CRSP) and COMPUSTAT. Stocks with market capitalizations of less $25 million at the formation month are excluded. Financial firms—those firms with one–digit standard industrial classification codes of six—are also excluded. The sample period covers January 1975 to December 2014.

	EW					VW				
	Unprofitable	2	3	4	Profitable	Unprofitable	2	3	4	Profitable
Panel A: Raw returns										
Weak	1.02	1.17	1.27	1.45	1.51	0.65	1.02	1.10	1.31	0.96
2	1.20	1.29	1.51	1.46	1.74	0.88	1.11	1.18	0.99	1.36
3	1.25	1.45	1.42	1.72	1.99	1.03	1.11	0.89	1.19	1.28
4	1.39	1.51	1.68	1.65	2.11	1.06	1.11	0.99	1.09	1.40
Strong	1.55	1.53	1.61	1.95	2.28	0.92	1.01	1.23	1.44	1.70
Strong–Weak	0.53	0.37	0.34	0.50	0.77	0.27	-0.01	0.13	0.14	0.73
	[4.69]	[2.61]	[2.12]	[2.97]	[4.29]	[1.62]	[-0.04]	[0.59]	[0.56]	[3.02]
Panel B: Factor-adjusted returns										
FF3	0.60	0.44	0.45	0.69	0.96	0.39	0.12	0.37	0.31	0.95
	[5.30]	[3.32]	[2.98]	[5.11]	[6.62]	[2.24]	[0.56]	[1.72]	[1.42]	[4.85]
Carhart	0.46	0.27	0.20	0.43	0.69	0.18	-0.06	0.06	0.04	0.69
	[4.16]	[2.04]	[1.35]	[2.91]	[4.91]	[1.10]	[-0.30]	[0.26]	[0.19]	[3.65]
FF5	0.58	0.49	0.45	0.73	0.89	0.35	0.16	0.41	0.67	1.10
	[4.61]	[3.57]	[2.77]	[5.00]	[5.84]	[2.06]	[0.72]	[1.71]	[3.04]	[5.49]
Panel C: Book-to-market ratio and market capitalizations										
Book-to-market ratio										
Weak	0.92	0.99	0.95	0.87	0.78	0.80	0.74	0.69	0.57	0.48
2	1.12	0.98	0.87	0.75	0.73	0.99	0.76	0.62	0.48	0.41
3	1.14	0.91	0.79	0.67	0.63	1.03	0.71	0.56	0.43	0.34
4	1.05	0.84	0.70	0.60	0.54	0.97	0.67	0.51	0.41	0.32
Strong	0.79	0.76	0.64	0.54	0.42	0.73	0.65	0.49	0.40	0.29
Market capitalization										
Weak	895	1876	2070	2076	1651					
2	1539	2682	3473	3612	3678					
3	1728	2858	3462	3896	4019					
4	2142	2796	2708	3066	3103					
Strong	1209	2154	2318	1978	1598					

Table A3. Average Monthly Returns on Gross Profit Growth Portfolios

This table shows average monthly returns on ten portfolios sorted on gross profit growth. For each month *t*, NYSE, AMEX, and NASDAQ stocks with the share code of 10 or 11 are sorted into decile portfolios based on the most recent quarter gross profit growth using NYSE breakpoints. Gross Profit growth is measured as the year-over-year changes of gross profit (revenues minus cost of goods sold, REVTQ–COGSQ, obtained from Compustat quarterly items) divided by book equity of the prior year. Book equity is shareholder equity, plus deferred taxes (Compustat item TXDITCQ), minus preferred stock (PSTKQ) if it is available. Stockholders' equity is as given in Compustat data item (SEQQ) if available, or else common /ordinary equity plus the carrying value of preferred stock (CEQQ+PSTKQ) if available, or else total assets minus total liabilities (ATQ–LTQ). Profit related data in Compustat quarterly files are used in the portfolio sorts in the months immediately after the most recent public quarterly earnings announcement dates (item RDQ). We require the fiscal quarter end that corresponds to its most recently announced quarterly earnings to be within three months prior to the portfolio formation. We impose this restriction to exclude stale profits data. The book-to-market market ratio is the ratio of 1-quarter-lagged book equity over the market capitalization of the previous month of portfolio formation. The P10 portfolio consists of the high gross profit growth firms while the P1 portfolio consists of the low gross profit growth firm. The portfolios are held for the following month *t* +1(M1), from month *t* +1 to *t* + 3 (M3), from month *t* +1 to *t* + 6 (M6), from month *t* +1 to *t* + 9 (M9), from month *t* +1 to *t* + 12 (M12), from month *t* +1 to *t* + 24 (M24), respectively. This table reports the returns for these PG portfolios as well as the zero-investment portfolio HL (high-minus low-growth) that takes a long position in P10 (the portfolio with the highest profit growth) and takes a short position in P1 (the portfolio with the lowest profit growth). Panel A reports equal-weighted returns and Panel B reports value-weighted returns, in percentage. [*t*-statistics] are reported correspondingly. The sample period covers January 1975 to December 2014.

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	HL
Panel A: Equal-weighted portfolios											
M1	1.11	1.33	1.32	1.51	1.51	1.50	1.65	1.64	1.77	2.02	0.91
											[7.55]
M3	1.28	1.41	1.42	1.53	1.48	1.52	1.63	1.62	1.70	1.85	0.57
											[4.87]
M6	1.46	1.54	1.50	1.57	1.52	1.54	1.62	1.63	1.66	1.74	0.27
											[2.43]
M9	1.60	1.62	1.55	1.63	1.56	1.57	1.62	1.62	1.65	1.66	0.05
											[0.49]
M12	1.70	1.60	1.70	1.59	1.64	1.57	1.58	1.60	1.60	1.62	–0.09
											[–0.90]
M24	1.79	1.73	1.62	1.62	1.57	1.59	1.61	1.62	1.65	1.59	–0.20
											[–2.35]
Panel B: Value-weighted portfolios											
M1	0.70	1.04	1.08	1.07	1.17	1.09	1.11	1.07	1.27	1.40	0.70
											[3.98]
M3	0.83	1.12	1.10	1.14	1.17	1.08	1.14	1.01	1.21	1.28	0.45
											[2.68]
M6	0.94	1.17	1.10	1.18	1.17	1.07	1.15	1.08	1.16	1.27	0.32
											[2.07]
M9	1.00	1.17	1.15	1.19	1.18	1.13	1.17	1.10	1.16	1.20	0.21
											[1.38]
M12	1.04	1.17	1.18	1.18	1.19	1.16	1.13	1.14	1.13	1.17	0.13
											[0.88]
M24	1.10	1.15	1.18	1.18	1.16	1.19	1.14	1.15	1.18	1.16	0.06
											[0.45]